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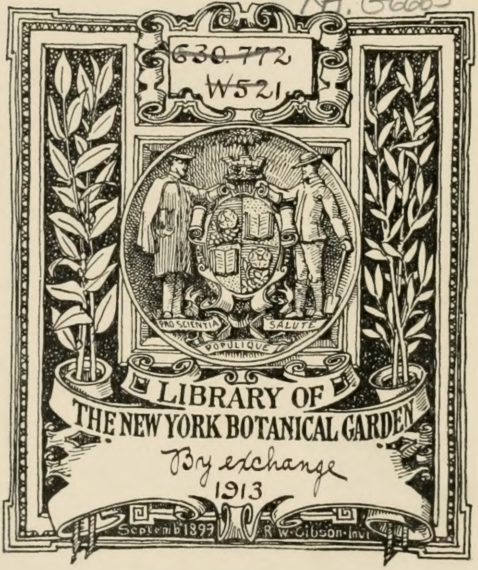

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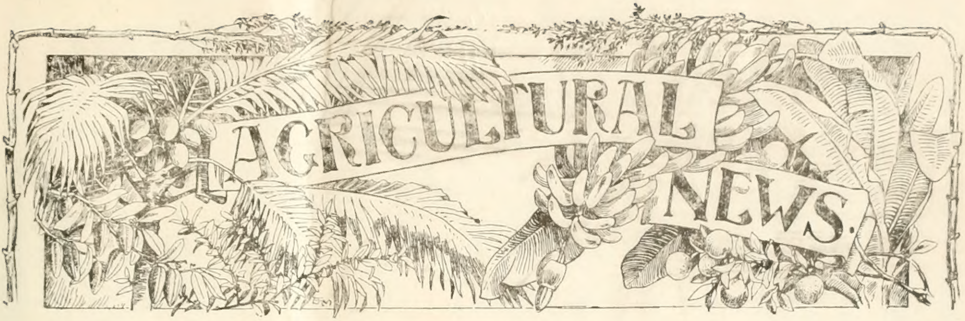

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOLUME XII.

JANUARY TO DECEMBER, 1913.

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ERRATA IN VOLUME XII.

Page 13, column 2, line 9, from bottom, for Lucius' read Lucius.
„ 57, column 1, line 5, from bottom, for rembered read remembered.
„ 97, column 2, line 3, for Saccharomycetes read Saccharomyces.
„ 109, column 2, line 10, from bottom, for disease read disuse.
„ 178, column 2, line 22, from bottom, for pazed, read paid.
„ 186, in last column, line 26, from bottom, for *paralella* read *parallela*.
„ 217, column 2, line 26, for Cymnadenia read Gymnadenia.

Vol. XII. No. 279.] SATURDAY, JANUARY 4, 1913. [One penny.

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Agriculture at the British Association, 1912.

THE recent publication of a review* of the proceedings in the Agricultural Section of the British Association at Dundee in September last gives an opportunity for presenting a summary of the matters that were dealt with by that Section. In choosing these, it should be explained, it was decided that they should be confined to four subjects, two of which should possess a definite local importance. The subjects selected eventually were milk problems, animal nutrition, the application of meteorological information to agricultural practice, and the sources of the food-supply of Great Britain and Ireland.

After the presidential address there came papers on milk. In one of these it was contended that, where interpretation of milk records from many cows is required, a cow's milking capacity should be expressed by a single and unqualified figure. Such figures as total yield per calf, total yield per calendar year, or average per week, always vary greatly from time to time, for the same animal, because they are much influenced by outside conditions. It is therefore claimed that better results are obtained by the use of: 'the maximum yield per day, the average yield per day during the fifth to twelfth week after calving, and the maximum yield per day maintained or exceeded for not less than three weeks.' The conclusions of a second paper possess their importance in the feeding of cows. They state that when cows are given a large quantity of water, the amount of water is not increased, nor the proportion of fat decreased, in the milk; and that concentrated rations give the largest yields of milk, although milk from cows fed on turnips contained a greater quantity of fat—more in fact than was in the original ration. Another paper drew attention to the circumstance that the fat globules in milk vary considerably in size, even in different milks from the same breed of cows, and that as far as the authors could ascertain, there is no evidence to support the conclusion of Storch that these globules are surrounded by a membrane.

The opening of the discussion of the nation's food-supply was the means of bringing forward several facts that are of all the greater interest because they have not perhaps been thoroughly recognized up to the

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**Nature*, December 5, 1912.

present. Among them was the striking conclusion from statistics, that rather more than one-half of its total food requirements are produced by the United Kingdom—that is to say, excluding products like sugar, tea and coffee, which are not, or cannot be grown to any extent in the country. The actual figures are about one hundred and eighty million pounds for home production and two hundred and sixty million for imports, of which latter quantity thirty-nine million pounds pays for sugar, tea, coffee and cocoa. As is stated: 'These figures came as a great surprise to the meeting, and it is certainly satisfactory to know that British agriculture has so well maintained its position in competition with other countries.' There is, however, a matter for regret in the falling off in wheat production, which seems to be partly due to the competition arising from the circumstance that wheat appears to be a pioneer crop in the development of those new countries to which it is suited.

An account of the progress of agriculture in Scotland during the past fifty years showed that, while there has been a decrease of many thousands of acres under grain, turnips and potatoes, the areas under rotation and permanent grasses have increased—the latter very considerably. There have also been large increases per acre of all crops, particularly of wheat and potatoes.

In order to deal effectively with meteorological matters, a joint meeting was held with the meteorological department of the mathematical and physical science section. Dr. W. N. Shaw opened the session by dwelling upon the use to the agriculturist of forecasts, and the application of the present knowledge of climate: in the latter connexion, the meteorologist wanted to know if his statistics are useful to the agriculturist, and in what form they should be presented for employment by him. Among the papers that were of more direct agricultural interest was an account by Dr. E. J. Russell of the effect of climate on the plant, both directly, and indirectly through its influence on the soil; in the latter connexion, the chief matter for consideration was the increase of nitrates in the soil during warm weather, and their removal by heavy rains. Another matter of direct import in relation to the raising of crops was the testimony by a practical farmer as to the great utility of local observations in conjunction with a central organization like the Meteorological Office, the speaker expressing the opinion that meteorology ought to be taught to all those who are preparing to take up responsible positions on farms or estates.

For the consideration of animal nutrition, another joint meeting was held—in this case with the physiological section. One of the most interesting papers dealt with ten years' experiments in sheep and cattle feeding, and showed that linseed cake holds a pre-eminent position as a food, 'animals fed on this always making greater progress than those on other substances.' A further matter of much interest is that, 'a mixture of wheat, cotton seed and cotton cake made up to give the same analysis as linseed cake proved economically a failure.' These and other matters lead to the conclusion that: 'our present methods of valuing feeding stuffs do not afford particularly useful information.' An explanation of this fact was supplied in another paper, which showed that the expression of the value of a food in terms of carbohydrates, fats and proteids is insufficient, for there are other equally important nutritive bodies whose removal decreases the value of the diet or even causes disease in the animals to which it is given. A succeeding paper gave an illustration of such bodies in the vitamines which, it may be mentioned, have received brief attention already* in this journal.

Other work of more local interest, relating to nutrition, was concerned with the relative values of white and standard bread, and the rearing of calves. For the latter, investigation has shown that whole milk is the best food, up to the time of weaning; but that later, cotton seed oil and linseed oil may be substituted for butterfat in the ration, without causing any lessening in the weight of the slaughtered animals.

The matter would not be complete by reference to the special subjects alone. There were several general papers of great interest, but among them any mention at length can only be made to those by Dr. Hutchinson, dealing with the action of lime in soils and with experiments on nitrogen assimilation. The author shows in the first case, that lime can partially sterilize the soil in the same way as antiseptics or heat; it causes at first the death of many of the protozoa, and then there is a marked growth of bacteria and a consequent increase of plant food. Lastly, the work on nitrogen assimilation demonstrated that the action of bacteria in this process is increased by adding to the soil organic substances, among which sugar is included, the influence of the latter being especially marked at high temperatures—a fact that must enter into the consideration of the effect of molasses on the soil.

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* *Agricultural News*, Vol. XI, p. 339.

SUGAR INDUSTRY.

SUGAR AND RICE IN INDIA.

The following facts are taken from a recent consular trade report, and appear in the *Modern Sugar Planter* for November 16.

Sugar comes second in importance in the imports into India, and represented nearly 60 per cent. of the total value of the imports of food and drink. The arrivals of cane sugar during the year ended March 1912, amounting to 9,887,694 cwt. of 112 lb. each, compared with 11,814,187 cwt., for the preceding year. Java supplied 8,160,468 cwt., Mauritius 1,709,773 cwt., and China 12,656 cwt. The imports of beet sugar amounted to 254,138 cwt., against 724,958 cwt. for the fiscal year ended March 1911. Austria-Hungary furnishes the greater part of the beet sugar supplies, the receipts from that country for the year ended March 1912, amounting to 241,433 cwt., compared with 714,097 cwt. for the preceding year.

The Indian sugar crop gathered at the beginning of 1911 was satisfactory in most places and was estimated at 2,217,800 tons of raw sugar compared with an average of 2,034,400 tons for the preceding five years. The good prices in 1911 stimulated planting, with the result that the crop gathered at the beginning of the present year is believed to have exceeded the previous year's figures by 10 per cent. in the area planted, and the total yield, exclusive of palm sugar, is estimated at about 2,390,400 tons. The foregoing figures comprise only those tracts that make returns of cane cultivation. It is believed that India produces about 3,000,000 tons of cane sugar.

Rice is the staple food of most of India, and about 35 per cent. of the cultivated acreage in British India is under this product. Burma furnishes about three-fourths of the Indian shipments. The rice is principally exported from January until April. This product arrives on the western markets simultaneously with supplies from Saigon, Siam, and other principal sources, and the market is therefore glutted and prices depressed. Java, being south of the Equator, harvests its rice about six months later than India, and the crop, being sold on bare markets, brings a much larger price. The question has been raised whether it might not be possible to adopt modern silos with a view to storing the Indian rice and marketing it at a later date.

The rice crops of 1910-11 and 1911-12 in the area that furnished forecasts were estimated at 27,896,900 and 26,099,600 tons for the two years, respectively, as compared with an average of 23,167,300 tons for the previous five years.

Ceylon is the largest purchaser of Indian rice, the shipments to that Colony for the year 1911-12 amounted to 380,978 tons. Other markets were: Japan, 140,922 tons; China, 38,214 tons (not including large shipments by way of Straits Settlements); Java, 277,869 tons; Germany, 262,113 tons; United Kingdom, 136,778 tons; Netherlands, 151,372 tons; Austria-Hungary, 134,301 tons. Included in the above figures rice in the husk was exported to the amount of 55,263 tons, valued at $1,180,000, of which Ceylon took 33,901 tons and Straits Settlements 20,844 tons.

CARDAMOMS.

The following description and account of the cultivation of cardamoms is taken from the *Semi-Annual Report* of Messrs. Schimmel & Co., dated October 1912. The original article appeared in the *Chemist and Druggist*, 1912, p. 367.

The cardamoms of British commerce are all derived from *Elettaria Cardamomum*, Maton, N.O. Zingiberaceae, which grows wild or is cultivated on the Malabar coast and in Ceylon. There is a large market for the spice in Calcutta; the annual consumption in India and Burma is computed to be nearly 1,000,000 lb. Formerly scarcely any other than Malabar cardamoms were imported into Britain, but the Mysore variety now affords most of the fine quality. The latter plant possesses a more robust habit and bears exposure better than the Malabar type. It is not known how the district name 'Mysore' came to designate the variety of a cardamom plant. There appear to be two varieties of Malabar plants, var. *minus* being confined to Southern India and var. *majus* growing in Ceylon. The latter is distinguished by its shorter stems, broader leaves and more globose fruit. In the shady mountain forests of Canara, Cochin and Travancore the cardamom plant grows between the altitudes of 2,500 and 5,000 feet. The plant is best suited to a rich, moist, loamy soil, protected from strong winds. These conditions are met with in the betel-nut and pepper gardens of Mysore and of Canara, and also in the cultivated cardamom valleys of Ceylon.

In the forest district of Coorg (Mysore) the cardamom gardens are laid out in February or March, simply by making clearings in the forest, a space of some 20 to 30 yards of jungle being left between the gardens. Superstition plays an important part, felling of the trees being only permissible on certain days of the week and before noon. The natives also believe that the presence of such plants as ebony, nutmeg and pepper favourably affects the development of the cardamom plants. In the fifth year a full crop is produced. After seven years more, the plants become sickly. Some of the large trees in the jungle-screen surrounding the fields are felled; the falling trunks kill many of the cardamom stems, thus stimulating the rhizomes to produce new shoots, thereby renewing the producing capacity of the plot another eight years, when the process of renovation is repeated.

In Ceylon the cultivation is carried out much more systematically. The favourite cardamom districts are Matale, Medamahanwara and Hewahata. The undergrowth of the land intended for a cardamom plantation is cleared; holes are dug 1½ to 2 feet wide, 12 inches to 15 inches deep and 7 feet apart in rows at a similar distance. The bulbs must not be planted too deep or they will rot. The use of seedlings instead of bulbs is increasing, however, the Mysore variety being most frequently grown from seed. Curiously enough, only a small proportion of the seed germinates

In Ceylon the plants flower almost all the year round; picking begins at the end of August and continues until April. The fruit is carefully dried by exposure to the sun, or in wet weather by artificial heat. Machines for removing the calyx tube and the stalk have been introduced, and after passing through these the capsules are graded and treated with sulphur vapour.

A table given at the end of the article shows that the cultivation of cardamoms in Ceylon has been steadily decreasing. In 1911 the area and export were 7,300 acres and 564,819 lb.; in 1910, they were 7,426 acres and 639,007 lb.

FRUITS AND FRUIT TREES.

THE BUDDING OF THE MANGO IN ST. LUCIA.

In a recent issue of the *Agricultural News* an account was given of recent work on the budding of the avocado in Dominica.

Information has been lately received through the Agricultural Superintendent, St. Lucia, of similar investigations carried out by Mr. Archibald Brooks, Assistant Agricultural Superintendent, on the budding of the mango.

It appears that Mr Niles, the Junior Instructor and Overseer at the Experiment Station, Union, was the first to achieve complete success in mango-budding; but a more general investigation of the subject on a larger scale, extending over the last eighteen months, is described by Mr. Brooks in his notes, which constitute the basis of the present article.

It is pointed out, first of all, that success in mango-budding mainly depends upon the vigorous condition of the stocks. For this reason the preliminary attempts to bud both mango and avocado stocks raised in bamboo pots proved unsuccessful. Flute and T-budding and splice grafting were tried, and it was endeavoured to increase the vitality of the young stocks by the judicious application of sulphate of ammonia. Every attempt proved unsuccessful; the buds remained dormant for several weeks, and in some instances the avocado buds commenced to swell, but eventually turned black

Having at the time a large bed of vigorous one year-old seedling mango stocks, it was decided to attempt budding them by similar methods to those employed in the propagation of oranges. The inverted T method was tried first, and the attempts proved very successful: about 60 per cent of the buds developed and produced good plants.

It is stated that this method has an advantage over the well-known patch budding of citrus plants in that the former does not demand such a high degree of skill and dexterity; for in patch budding it is, for instance, essential that the bud be cut so as to fit the incised area of the stock in order to make a perfectly tight union. In the case of the inverted T method it is only necessary that the bud be inserted beneath the bark and firmly tied in position.

The selection of bud-wood it is pointed out, must be confined to young woody branches. The buds should be tied in position with raffia; budding tape should *not* be used: for mango and avocado stocks, being more sappy than citrus stocks, tend to favour the development of fungi around the wound when covered with waxed tape. This was found to be one of the causes of previous failures already referred to.

A point which next received consideration was the transplanting of the budded stocks. Some of the plants were lifted and potted in bamboo joints. The results show that this can be done successfully; but it is necessary to exercise great care, and only the largest bamboo pots should be employed. It has been found that plants with unusually long tap roots should not be potted, but transplanted direct in the field. Reducing to any great extent the length of the tap root, when potting, generally results in the death of the plant.

Other plants were transplanted in a similar way to that employed in citrus cultivation, and with the same satisfactory results. The plants were forked up and all the soil shaken from their roots. The leaves were clipped and the plants transplanted to permanent positions in the field.

In concluding his notes on this useful piece of investigation, Mr. Brooks points out the several practical disadvantages attending the usual method of mango propagation, namely, inarching; and finally, it is stated that experiments are now in progress having for their object the determination of the length of time that the plants will survive between lifting and their final transplanting. The results should provide useful facts in connexion with the transportation of the budded plants over long distances.

A total of 4,339 plants was distributed from the nurseries of the St. Lucia Department of Agriculture during last month; they included 3,150 lime plants and 608 Para rubber plants, as well as 300 of cacao The Agricultural Superintendent states that the present demand in the island for lime plants exceeds the supply by about 20,000, and that preparations are being made for raising 100,000 plants next year. It is estimated that the flooding of the Experiment Station at Union in October caused the loss of 70,000 lime seeds and seedlings. Additional trouble has resulted from the heavy rains of November, which have made it difficult to establish lime seedlings.

THE CULTIVATION OF CONIFERS IN THE TROPICS.

The importation of species of Coniferae into the West Indies has resulted in the establishment, on a small scale, of these useful and attractive trees in several of the islands, notably in Dominica. The cultivation of conifers under dry conditions in the Tropics is dealt with in a recent issue of the *Bulletin Agricole du Congo Belge* and since much of the information given is the result of pioneer work with valuable exotic species, the following article has been prepared embodying those facts contained in the paper which are thought to be of direct value and interest with regard to the growing of Conifers in the West Indies.

As a matter of general interest it might be pointed out first of all that flowering plants (Phanerogamia) are divided botanically into two divisions, Gymnospermae and Angiospermae. The division Angiospermae includes all monocotyledonous and dicotyledonous plants, the chief characteristics of which are well known to the agriculturist. The gymnospermous plants, which contain the group Coniferae, are not generally so well understood, particularly in the Tropics, so that a brief description of their chief biological characteristics may serve as a useful introduction to later information of an economic nature.

The gymnospermous flowering plants are not so highly differentiated as the Angiosperms, and in many respects they resemble the Vascular Cryptogams (ferns), forming as it were an intermediate group. They are large plants, either shrubs or trees, and include the Cycads, which in many of their characters, approach the Vascular Cryptogams, the Conifers and a third group, the Gnetaceae, which approach nearer to the Angiosperms. Like those of the Angiosperms, their reproductive organs are aggregated to form flowers which differ markedly, however, from the flowers of the Angiosperms in the fact that when carpels are present the ovules are borne freely exposed on their upper surfaces. The carpels are not closed up to form ovary, style and stigma. Hence the name Gymnosperm, which means 'naked seed'. The flowers are always unisexual, and the plants are usually monoecious. In the Coniferae, the seeds are polyembryonic, but only one embryo develops. Each embryo contains a number of cotyledons. The seeds are distributed naturally by the wind; and it is also through the same agency that pollination is effected. After germination, the first year's shoot has no scale leaves or dwarf shoots, characteristic of the mature plant, but the tap root, typical of the Coniferae, begins to develop at once.

The general *arrangement* of tissues in the Coniferous tree closely resembles that of the Dicotyledons; and secondary growth, resulting in the formation of wood, is effected in exactly the same way as in Dicotyledons. But considerable differences exist as regards the *structure* of the different tissues, amongst which might be mentioned the absence of true vessels and companion cells in the vascular bundles, and the presence of the peculiar transfusion tissue near the centre of the leaf. Large resin passages and glands are also typical of both stem and leaf.

The life-history of the Coniferae is complex, and space does not permit of its description here. It might be noted that the female cone (which is not a fruit in the ordinary botanical sense of the term) takes about three years to mature.

Physiologically, most conifers are xerophytic (i.e., adapted for growing under dry conditions) and many have mycorhizae, or 'root fungi', which fix nitrogen for the tree in return for the tree's supply of carbohydrates. The narrow, acicular form of the leaves, their thick cuticle, the sunken stomata, the presence of a strong hypodermis, the simple vascular system, are marked xerophytic characters, all tending to reduce transpiration to a minimum. At the same time the importance of transpiration to temperate or subtropical evergreens growing in the Tropics must not be lost sight of, in connexion with the maintenance of a suitable leaf temperature for the carrying on of photosynthesis.

To return to the account in the publication mentioned, this states that, in the gardens of the Kisantu Mission, Lower Congo, four exotic species of conifers have been grown successfully under natural conditions without any undue care or attention. When once established, they can resist the dry season, and in spite of the naturally poor soil at Kisantu the trees have grown vigorously, as is shown by the photographs in the article from which this information has been obtained. The plants are raised from seed; vegetative reproduction has been found unsuccessful.

The species first referred to is *Araucaria Bidwillii.* It is one of the most useful conifers and is very ornamental. It furnishes an excellent cabinet wood, often very beautiful; it produces large quantities of nutritious seeds, very agreeable to the taste, and finally a resin, rich in gum, principally employed in the manufacture of varnish. By tapping, it is possible to obtain 16 lb. from a single tree in one year. *Araucaria Bidwillii* is a native of Australia when it attains a height of 100 to 150 feet. Eight-year-old trees growing at Kisantu measure 40 to 50 feet in height. Specimens of the tree are to be seen in the Dominica Botanic Gardens.

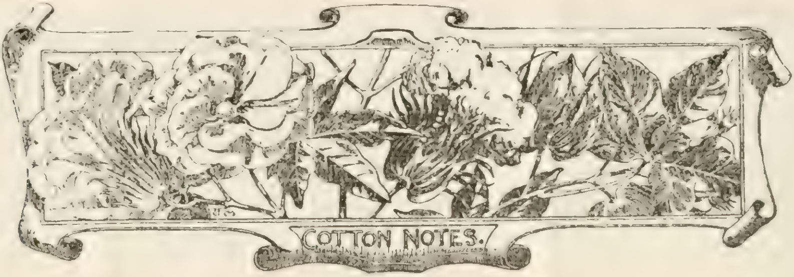
The second species described is *Araucaria excelsa*, commonly known as the Norfolk Island pine. It is a very ornamental tree and its wood resembles that of *Araucaria Bidwillii.* The resin of this tree is also said to be of good quality. In its native country, *Araucaria excelsa* grows to a height of 150 to 200 feet and has a girth of 20 to 30 feet. Three-year-old trees at present growing at Kisantu are about 8 feet in height.

Another species, *Biota orientalis*, is less useful than the Araucarias, but is nevertheless valuable for making fences and wind-breaks The wood is very hard and is used for making the handles of tools and implements.

Finally, the suitability for the Tropics of another species —*Juniperus bermudiana*—has also been demonstrated at Kisantu. This tree furnishes hard-wood and resin, like the other species.

It is considered probable that the following species of Conifers would also grow well in the Lower Congo: *Araucaria imbricata, Dombeya chilensis, Columbea imbricata, Araucaria Dombeyi*, natives of Chili; *Araucaria brasiliensis*, indigenous to Paraguay; *Araucaria Cunninghamii*, of Tasmania and Eastern Australia; *Araucaria Cookii*, a native of New Caledonia; and *Dammara orientalis* of the Moluccas.

The Jamaica Colonial Report, 1911-12, indicates continued progress in agricultural matters in that island. As was stated in a recent number of the *Agricultural News*, the Farm School at Hope has been enlarged, and well-bred dairy stock has been imported. The special insecticide 'Paranaph' continues to be employed for ticks on cattle; outbreaks of anthrax have been kept under control. The 'Panama disease' of bananas has caused some anxiety but is being promptly dealt with. Progress continues in the sugar industry: locally raised seedling canes J.71 and J.72 have shown good promise, and new machinery is being introduced on several estates. The central factory at Rose Hall is in active operation. The cultivation of cassava, castor oil beans, Castilloa rubber, and Sea Island cotton received the attention of progressive planters during the year under review.


COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date December 16, with reference to the sales of West Indian Sea Island cotton :—

About 50 bales of West Indian Sea Island cotton have been sold since our last report; they include Old Crop St. Kitts, Barbados, Antigua and St. Croix from 15*d.* to 17½*d.* and New Crop St. Kitts at 18½*d.*

Prices are firm, but there is only a limited enquiry. Holders of American Sea Islands, which have proved to be undesirable in quality this season, are pressing sales.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending December 14, is as follows:—

With only a moderate demand throughout the week, and that chiefly for Extra Fine and No. 1 off cotton, the market remains steady and unchanged, with Factors inclined to be firm in their prices. We have, therefore, only to renew our last quotations.

There has been no further inquiry for Planters' crop lots.

We quote, viz.:—

Extra Fine	29½c.	=	16¾*d.*	c.i.f., & 5 per cent.
Fully Fine	27½c.	=	15½*d.*	,, ,, ,, ,,
Fine	26c.	=	14¾*d.*	,, ,, ,, ,,
Extra Fine off in preparation	26c.	=	14¾*d.*	,, ,, ,, ,,
Fully Fine off in preparation	24c.	=	13¾*d.*	,, ,, ,, ,,
Fine off in preparation	22c.	=	12¾*d.*	,, ,, ,, ,,

THE WEST INDIAN COTTON-GROWING SEASON, 1911-12.

As was promised in the last issue of the *Agricultural News*, an article dealing with the general conditions during the last cotton-growing season in the West Indies is continued in this number.

NEVIS. At the commencement of the season, it was estimated from the preparations being made that there would be an increase of about 20 per cent. in the area planted in cotton. In the next month, the work on estates was concerned mainly with the selection of cotton seed for planting and the destruction of the old plants; in May, it was expected that there would be an increase in the area planted, new land being prepared in several places. Dry weather and want of labour during June and July prevented the realization of this anticipation, as very few fields were established by that time, although a large amount of supplying was done. The continuation of the dry weather caused most of the cotton planted during July to be lost, while that put in during June made little progress. At the end of August and September an impulse was given to planting by the receipt of rains, and the result was that it could be reported in October that the prospects of the crop had improved considerably. Leaf-blister mite and the cotton worm made their appearance The area under cotton for this crop was about 2,060 acres, of which more than one-half was in the hands of small cultivators; the increase on the area in the previous season was about 600 acres. In November, there was an improvement in the crop, though there was considerable loss through the cotton worm in one district; about 50,000 lb. of seed-cotton had been gathered from plants established in June. In December, there was loss from boll-dropping, and it resulted from this and the other causes indicated that the yield per acre was generally below the average, though good returns were obtained in some districts. A feature of the season was the prolonged drought. Before April was reached, by which time all the cotton had been picked and the old plants were being burned, it was estimated that the total yield of lint would be about 120,000 lb.

THE VIRGIN ISLANDS. Favourable progress was made at the beginning of the season; and considerable interest was shown by the peasantry, which was stimulated by the holding of meetings in April, at which the Agricultural Instructor dealt mainly with matters concerning cotton-growing. Sowing was in full progress by the end of May, and the sale of cotton seed at the Experiment Station exceeded that of any previous season. Very dry weather began to be experienced in June, and Aphis showed itself in July; the demand for seed still continued during the latter month. By the end of August, it was evident that considerable areas of cotton would have to be replanted; in some cases the very young seedlings that had been obtained were cut off by beetles. The dry conditions continued during the next few months, until near the end of October, when useful rains fell and it seemed that the recuperative power of the cotton plant would cause it to show adverse effects less than any of the other crops; the cotton worm showed itself in many districts, and in December some trouble was experienced with the pest, while by the end of February leaf-blister mite had appeared to some extent. In general, there had been much improvement of the crop before picking came to an end at the beginning of June, when the harvest had amounted to about 51,000 lb. of lint.

When the complete returns of the exports from the different islands have been received, an early opportunity will be taken to publish these in the *Agricultural News*. So far, the returns are complete except for those from Antigua for the quarter ended September 30, 1912 Excluding these, they show that the amount of cotton exported from the West Indies in the crop season, October 1, 1911, to September 30, 1912, was 7,186 bales, weighing 2,608,697 lb and valued at £162,507.

PRICES DURING 1911-12.

The first report of Messrs. Wolstenholme and Holland for the period October 1911 to September 1912, inclusive, shows that West Indian Sea Islands were being sold in good quantity at steady prices, while Carolina Islands were being held for 20*d.* or over, without buyers, and the best Florida, competing as usual with the lower qualities of West Indian, was being sold freely at 13*d.* The market was also firm at the end of October, chiefly because of short supplies, but the tendency of American Sea Islands was downward. Sales of West Indian continued in the commencement of November; there was very little stock, and prices were firm. Fully fine Carolina Islands was offering at 15½*d.* c.i.f, but the quality was so very inferior that West Indian Sea Island was expected to be purchased in preference. Most of the cotton sold early in December was the remainder of the previous season's crop, realizing 13*d.* to 16*d*, while a few bales of superior new crop cotton obtained about 18*d.* The fine spinning trade, which had been rather inactive, continued in this state. Sales continued until nearly the end of the year (1911), with fairly good prices for both old and new crop. Toward the end of the year, the absence of desirable qualities caused little business to be done in West Indian Sea Islands. Sales were, however, made at the end of the year when the market remained steady because of the inferior quality and quantity of the Carolina Sea Islands crop. The sales continued at the beginning of the year, and prices remained very firm: at the end of January the market was still firm, and good qualities commanded corresponding prices.

Sales and the same state of the market continued in February, March, April and May, chiefly because the poor character of the Carolina crop, and its smallness, were making most users purchase West Indian in replacement; in May, however, there was very little demand for anything over 20*d.* The sales were small in this month, and consumers with their immediate wants supplied were not eager buyers at the time; in June, however, the sales increased, but the use by fine spinners of Sakellarides for manufacturing a coarser article, which would sell readily, commenced to affect the market. By the end of June, sales were very small, and the demand very limited; the former improved in July, though spinners still held supplies sufficient for some months to come. The conditions continued, with fair sales of West Indian Sea Island; and in August, though sales were effected at reduced prices, spinners were indifferent buyers, and holders of Carolina cotton were pressing sales in competition with West Indian. August ended with a fair business at the reduced prices, the bulk of it being at 14*d.* to 16*d.* In September, there were small sales at reduced prices, and buyers were waiting to see how the American Sea Island cotton market would open in the next month; besides, many spinners were continuing to use various kinds of Egyptian cotton. Messrs. Wolstenholme and Holland's reports showed that this condition persisted up to the end of the period under review.

The following table gives the prices per lb. for Sea Island cotton in the Liverpool (Messrs. Wolstenholme and Holland) and Charleston (Messrs. H. W. Frost & Co.) markets during the season under review:—

COTTON PRICES IN THE LIVERPOOL AND CHARLESTON MARKETS, 1911-12.

Liverpool.			Charleston.			
Date. 1911.	General.	St. Vincent.	Date. 1911.	Extra Fine.	Fully Fine.	Difference.
	d.	*d.*		*d.*	*d.*	*d.*
Oct. 9	15-17	17½-22	Oct. 7	—	—	—
,, 23	15 17	19	,, 21	—	—	—
Nov. 6	16-18	—	,, 28	—	—	—
,, 20	13-16	—	Nov. 18	18	15¾	2
Dec. 4	17-19	20	Dec. 2	18	15¾	1
,, 18	—	—	,, 16	18-20	15-16	—
,, 30	15-19	20	,, 30	18	15-16	1
1912.			1912.			
Jany. 16	18-19	21	Jany. 20	18	15	1
Feby. 12	18-20	22-24	Feby. 10	18	15-16	2-3
,, 26	17-23	22-25	,, 17	18	15-16	1-5
Mar. 12	18-20	20-23	Mar. 9	—	—	—
,, 25	18-20	—	,, 23	*	*	—
April 3	19-22½	24	Mch. 30	*	*	—
,, 22	18 20	23	,, 13	18	15-16	2
May 6	19-20	21-24	May 4	—	—	—
,, 20	—	22-22½	,, 18	17-18	16-16½	—
June 3	19½-20	—	June 1	16¾-17¾	15¾	2¾-3¾
,, 17	20-21	22-30	,, 15	17½	17	3-3½
July 2	20	30	,, 29	—	—	—
,, 15	—	19-21	—	—	—	—
,, 29	21-22	18 21	—	—	—	—
Aug. 13	15½-18	—	—	—	—	—
,, 26	14-16	—	—	—	—	—
Sept. 9	14½-15½	—	—	—	—	—
,, 23	18	—	—	—	—	—

The outside prices for stains, in Liverpool, were 7*d.* and 12*d.*

COTTON-GROWING IN SOUTH AFRICA.

The following information regarding cotton-growing in the Cape Province and Rhodesia is taken from *The Board of Trade Journal* for November 7 and 14, 1912:—

According to information received by H.M. Trade Commissioner for South Africa from the Commissioner of Customs and Excise at Pretoria, it is reported that several prominent Cape Town gentlemen have been making careful investigations as regards the possibility of the establishment of a cotton-growing industry in the Cape Province. A local firm have undertaken to furnish the necessary funds for the provision of seed and ginning machinery, and to guarantee farmers that they will buy from them, gin, pack, and put on the Manchester market, all cotton which can be grown during the coming season.

The *Rhodesia Agricultural Journal* for October states that the experiments conducted this year in Rhodesia in connexion with the cultivation of cotton were extremely disappointing, resulting for the most part in total failure. This was mainly due to late planting and early frosts in May. In this respect the season was exceptional, but in any case it would appear that the localities best suited to cotton are at present too remote from railway communication, and too sparsely settled, for this crop to make much headway The question of the cost of production and the availability of sufficient cheap labour for picking still remains open to doubt, not only in Rhodesia, but in other parts of South Africa; and the expansion of the cotton-growing industry is consequently slow.

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* Private terms.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

The leading article in this number deals with subjects that were brought forward in the agricultural section of the recent meeting of the British Association at Dundee. The article provides a summary of several matters of interest to agriculturists in the West Indies.

Page 4 contains an interesting account of a method of budding for the mango that is employed by the Agricultural Department of St. Lucia.

On page 5 will be found an article of some importance that treats of the cultivation of conifers in the tropics. The employment of these trees may well be extended in tropical latitudes.

The continuation of an article on the West Indian cotton-growing season, 1911-12, is given on pages 6 and 7, together with a review of the market and a summary of the prices obtained during the crop year, in Liverpool and Charleston.

The Insect Notes, on page 10, are concerned with the black witch or tick bird (*Crotophaga ani*).

The same page contains the greater part of an article on important experiments that are being conducted with *Hevea brasiliensis* in Ceylon.

The papers in the recent Intermediate and Final Examinations for the Courses of reading of the Department are reviewed on page 13.

Publications of the Imperial Department of Agriculture.

Part 1 of Volume XIII of the *West Indian Bulletin*, together with the Index and Title Page of Volume XII, has just been issued. It contains the continuation of the papers presented at the recent Agricultural Conference, the subjects dealt with being Cotton and Agricultural Education.

The papers appearing under Cotton are: The Results of the Cultivation of Cotton in St. Vincent, by W. N. Sands; The Cotton Industry in the Leeward Islands, by H. A. Tempany, B.Sc.; The Cotton Industry in Barbados, by J. R. Bovell, I.S.O., F.C.S., F.L.S.; Cotton Selection in Montserrat, The manner of Cross-Pollination of Cotton in Montserrat, and Sakellarides Cotton in Montserrat, by W. Robson; The Cotton Boll Weevil, and Notes on Certain Cotton Pests, by H. A. Ballou, M.Sc.: Outline of Manurial Experiments on Cotton in Tobago, by J. de Verteuil, F.C.S.; Cotton Experiments in British Guiana, by Professor J. B. Harrison, C.M.G., M.A., F.I.C. and F. A. Stockdale, M.A., F.L.S.

Under Agricultural Education there are included the following: Agricultural Education in Grenada with Special Reference to the Boys' Secondary School, by D. H. Jones, B.A.; The Need for Higher Agricultural Education in the West Indies, by Dr. A. Fredholm; A Lectureship in Tropical Agriculture, by S. Simpson, B.Sc., M.R.A.S.E., N.D.A.; Peasant Agriculture in Grenada: Suggestions for its Control and Improvement, by G. G. Auchinleck, B.Sc., F.C.S.

The Annual Reports on the Agricultural Departments in St. Lucia and Dominica have been issued. The form of these has been changed, chiefly by an alteration of the order of the matter, so as to bring into prominence the more interesting parts of the report: and a series of chief headings, classifying the subjects of the report into sections having a wide significance, has been introduced. Both of the reports are illustrated.

The *West Indian Bulletin*, Vol. XIII, No. 1, is now on sale by the Agents for the publications of the Department, price 6*d.* post free 8*d.*

It may be mentioned that the agency in Barbados for the sale of the publications of this Department has been transferred from Messrs. Bowen and Sons to the Advocate Co. Ltd., Broad Street, Bridgetown.

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Some Recent Books on Cacao.

Two books on cacao have recently been reviewed in *Nature*: the first is entitled *Cocoa and Chocolate: Their Chemistry and Manufacture*; the second is entitled *Cocoa: Its Cultivation and Preparation*. The former volume, by R. Whymper, appears to deal mainly with the technique of manufacture, though a section is devoted to the botany and cultivation of the plant. In contradistinction to the comprehensive and critical survey of the chemistry of cacao is the brevity of the section dealing with its cultivation. *Nature* points out the omission of certain important facts which may not be commonly known, even in the West Indies. For instance, much of the Gold Coast cacao is marketed in an unfermented condition; and the fact that some manufacturers in the United Kingdom prefer unwashed cacao, alleging that it is of better flavour than the washed article, seems particularly noteworthy, as also does the suggestion that the practice of 'claying' easily degenerates into mere 'weighting'.

The above volume is, of course, designed for the use of manufacturers and chemists; the second book, by W. H. Johnson, meets the requirements of the planter, rather than those of the manufacturer. Owing to Mr. Johnson's having acquired experience in the West Indies, the Gold Coast and Ceylon, his information is devoid of bias in favour of the practice of some particular area—a statement which cannot be said to apply to most text-books on cacao. Such matters as the selection of a site and the formation of a plantation are dealt with in such a way as to afford a useful guide in future planting. The preparation of cacao for the market, and especially such fundamental matters as fermentation, washing and 'claying' are very well discussed, and the work as a whole should prove particularly useful in places where cacao is the chief article of export.

This volume is the second in the series of Imperial Institute Handbooks, prepared with special reference to the requirements of British West Africa.

The first of these books is published at 15*s.* net, by J. and A. Churchill; the price of the second is 5*s.* net.

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Plant Respiration and Sudden Changes of Temperature.

In the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases*, No. 9, 1912, an account is given of research work on the above subject recently conducted in France. It appears that the technique adopted in former experiments on the subject was open to criticism, the results of the different sets of experiments not being strictly comparable. In the research under review, the investigator took seedlings of kidney bean (*Phaseolus vulgaris*) deprived of the cotyledons and grown in distilled water, shoots of the broad bean (*Vicia Faba*) and young leaves of rye (*Secale cereale*) which had previously been placed in a 10-per cent. saccharine solution. In each experiment he took only one group, in order to avoid the individual differences always presented even by groups similar to each other. The study of respiration was made by the method of confined air, subjecting the graduated test vessels in which the respiration took place successively for a given time (usually very short) to the different temperatures provided for in the experiment. At the end of each experimental phase the carbon dioxide in a removed sample of air was measured. The results showed that sudden variations in temperature do not give rise to any stimulus to respiration, and that between the respirating activity corresponding to a given temperature and and that for a different temperature, the transition takes place gradually and comprises all the intermediate respiratory activities between those of the extreme temperatures.

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Useful Fibre from Maize Stalks.

A typical example of an investigation in which secondary results proved to be of primary importance is referred to in the *Experiment Station Record* for September 1912.

The object of the experiment was, in the first instance, to find out whether removing cobs from the corn stalk in the milk stage, instead of allowing them to mature, increased the sugar content of the stalk, as is supposed in the Stewart method for obtaining sugar from maize stalks. Negative results were obtained; but in the course of the experiments it was observed that when cobs were removed there was very little deposition of the hard siliceous matter which forms the outer coating of the maize stalk and thus prevents the use of the best fibrous matter when the cobs are allowed to ripen.

Consequently the removal of cobs renders the whole stalk resolvable into pulp and cellulose of the finest quality for paper and for all the the higher uses for which cotton cellulose is now employed.

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The Importance of Naphthalene in Creasote.

A somewhat remarkable discovery is referred to in the *Experiment Station Record*, for September 1912, in connexion with the quantity and quality of creasote found in two treated piles after long service.

It appears that about thirty years ago two wooden piles—records of the method of treatment are not available—were employed for some purpose in the teredo-infected waters of the Gulf of Mexico. A recent examination has shown that one of the piles is perfectly sound, whereas the other has been attacked, particularly at the water line.

Chemical analyses have demonstrated that the creasote in the perfectly preserved pile originally contained at least 40 per cent. of naphthalene fractions, a large portion of which have remained in the wood. The creasote in the less perfectly preserved pile contained little or no naphthalene.

Since naphthalene is a solid hydrocarbon which, according to recent work by J. M. Weiss, possesses a low antiseptic value, it would seem probable that the physical properties of this compound were to some extent responsible for the differences in the condition of the creasoted piles. Paraffin is another solid hydrocarbon, and although it possesses no antiseptic properties at all, it is able to prevent the decomposition of healthy tissue embedded in it.

INSECT NOTES.

THE BLACK WITCH OR TICK BIRD.

The black witch (*Crotophaga ani*) is an insect-eating bird occurring from South America to the Southern United States, throughout the Antilles, with the exception, however, that it is not seen in the islands of Montserrat, Antigua, St. Kitts and Nevis, in the British West Indies. Its occurrence in Dominica dates back only a very few years.

This bird is known by a number of common names, among which are the following: ani, black parrot, savannah blackbird, tick bird, black witch, keel bill, and (in St. Lucia) merle corbeau.

The black witch is generally conceded to be a most useful bird on account of its insect-eating habits; its food includes many pests, and certain insects which are not generally eaten by birds. In Jamaica, the black witch has been observed eating stink bugs* and cotton stainers: these are not often used as food by birds, on account of characteristic offensive odours possessed by them. Ticks also form part of the food of the black witch, and on account of its tick-feeding habits it is called the tick bird in certain localities. As an enemy of the insect pests of cotton, also, this bird is very useful.

As in the case of all insectivorous birds, however, this one captures and devours beneficial insects, such as lady-birds and wasps, and it is probable that any beneficial as well as injurious insects are eaten as opportunity offers. In addition to ticks and insects, seeds and berries are also eaten.

The question has recently been raised as to whether a useful purpose would be served by the introduction of the black witch into the island of Antigua. It would seem at first sight that the introduction of a bird whose feeding habits are known to be so useful could produce only beneficial results, but so many instances are known where the introduction of a species of bird or animal into a new locality has produced conditions other than those which were sought, that it is best carefully to consider whether there is another aspect of the question.

The habit of destroying ticks, stinking plant bugs and cotton stainers is one which entitles its possessor to recognition, but the fact that beneficial insects are also destroyed should be taken into account. There seems to be no records of definite observations which would lead to the forming of a conclusion as to the actual value of the black witch in the Lesser Antilles and the possibilities of its becoming a nuisance or even a pest in later years. Predaceous beetles (lady-birds) and wasps (Jack Spaniards) exert a considerable influence on the natural control of many insect pests, and the destruction of these forms of insect life might result in the increase of certain pests, especially the scale insects, which would not themselves be attacked by such a bird as the black witch.

It would be useful if planters and others who possess knowledge based on observation and experience in those localities where the black witch is well established, were to record their opinions in this connexion, in order that the matter may be carefully considered before definite recommendations are made; and any information on this subject would be welcomed if forwarded to the Head Office of this Department direct, or through the Agricultural Officers in the islands.

EXPERIMENTS WITH HEVEA IN CEYLON.

Bulletin No. 1, of the Department of Agriculture, Ceylon, issued in September last, describes experiments on the tapping of Hevea rubber trees. These experiments have been in progress for nearly four years, and Part III of the investigation described in the publication under review, deals with the effect of different intervals between successive tappings. Seven rows of ten trees each were selected; the trees were approximately twenty-five years old and had not been tapped previously for some years. In the experiment the trees were all treated alike, except that each row was tapped at a different interval of time. The average intervals between successive tappings expressed in days, were as follows: during 1909-10—1·4, 2 6, 4 0, 5·2, 6 7, 7·9, 9·1; during 1911—0, 2.6, 3·7, 4.9, 6·2, 7·4, 8·9, for each of the seven rows respectively.

The system of tapping is described as follows: 'The bark to a height of six feet was divided into four equal areas, each extending half-way round the tree. Each area was occupied by three V-shaped cuts. The four areas were tapped in succession—first the lower half of one side followed by the two upper areas in the same order.'

As regards the method of tapping, an interesting point was the change from paring and pricking to paring only, made in the middle of the experiments. All experiments of a similar nature in Ceylon have pointed to the superiority of the method of paring over that of combined paring and pricking; and in the present experiments the trees showed signs of injury up to the time of change of method which was believed to have been occasioned partly by the method employed.

In the statement of results several important points are brought to light. All the tables show that an increased yield is obtained from trees tapped at longer intervals, an increase which becomes apparent after tapping has been continued steadily for a considerable time. Row III., which gave the largest yield from the first area tapped, did not maintain its high position as regards the tapping of the second and third areas, even when allowance was made for a loss of a tree. The largest total yield from the first area tapped was given by row III., and the largest yield per tapping, by row VI. A fairer basis of comparison is afforded, however, by taking the yield per inch of circumference. It is then found that in the case of area I there is an increase from row I up to row III and thence a falling off up to row VII., whereas the second area gave a steady increase up to row V.

As regards the yield of dry rubber the annual amount varied for 1·2 lb. with tapping at an interval of 9 days to 2·85 lb. with tapping at an interval of 1·4 day. These yields are, of course, extremely small considering the age of the trees and the cause is supposed to be the close distance of planting.

Proceeding to the subject of overtapping, the complicated nature of the physiological effect of paring is pointed out and it is stated that even in the case of the most vigorous trees, the period allowed for the first renewal should not be reduced below four years. The important point however, is that light tapping steadily continued at intervals of from five to nine days, causes trees, although old and very closely planted, to give a greatly increased yield per tapping.

The bulletin under review concludes with the following summary:—

'(1) When Hevea rubber trees were tapped at different intervals on the system here described, the yield *per tapping* increased with the increase of interval up to an interval of about a week between successive tappings.

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*These belong to the family Pentatomidae, which includes the typical plant bugs of which *Nezara viridula* and *Edessa meditabunda* are good examples in the Lesser Antilles. The members of this family possess a disagreeable odour.

'(2) The yield for a given period was greatest at first from the trees tapped at frequent intervals. The relative yield from the trees tapped at longer intervals gradually increased until after three and a half years' continuous tapping, the yield from trees tapped once a week, may, at a particular season, become as great as or greater than that from trees tapped at any shorter interval.

'(3) This conclusion is at present confined to the case of a particular plantation of trees upwards of twenty years old planted at a distance of only twelve by twelve feet.'

EXPORT TRADE OF ST. LUCIA, 1911-12.

The St. Lucia *Gazette* for October 26, 1912, contained the Annual Report of the Treasurer for the year 1911-12.

This shows that the total exports from the island amounted during 1911 to £273,111, or £45,480 less than the imports and £34,156 less than the exports in 1910.

Of the produce of the island, by far the largest amount went to the United Kingdom, its value being £65,440; the next largest importing country was France with a value of £31,719, followed by Canada and the British West Indies with £9,678 and £2,780, respectively. The exports other than island produce were naturally composed of bunker coal, with a value of £152,951.

The following table gives the exports of the produce of the island, with the declared values; for 1910 and 1911:—

	1910.		1911.	
	Quantity.	Value, £.	Quantity.	Value, £.
Cacao (lb.)	1,637,400	40,935	2,073,600	46,656
Sugar, usine (tons)	5,199	64,987	4,288	52,535
,, muscovado tons	76	760	172	1,555
Logwood (tons)	463	936	2,638	5,276
Molasses (gals.)	95,220	1,914	74,306	1,400
Rum (gals.)	4,692	391	12,410	1,034
Cotton (lb.)	17,770	1,301	3,917	275
Honey (pkgs.)	229	402	363	447
Limes, green (pkgs.)	35	13	234	129
Lime juice (pkgs.)	70	319	49	148
Firewood (cords)	1,364	682	1,115	557
Hides and skins (pkgs.)	161	926	151	820
Coco-nuts (number)	6,750	119	19,750	110
Pimento sticks (No.)	13,175	545	14,103	428
Fresh fruit (number) and mangoes (pkgs.)	20,000 1,408	521	36,000 912	503
Various, unspecified	——	1,551	——	1,735

No statistical records have so far been kept of the exports of ships' stores, so that these are not included in the above figures.

It is pointed out in the report that a great disparity appears between the value of imports and exports; the difference, when the imports and exports of bunker coal are deducted, amount to £51,606, and the similar disparity in 1910 was £54,945. The report goes on to say: 'As a balance must be looked for, the difference may be taken to represent the exports as ships' stores, and other proceeds of the coal and shipping business, and the earnings brought into the Colony of St. Lucians working abroad.'

There was a considerable excess in the cacao exports over those of the previous year; whilst there was a decrease in the output of sugar. The cacao industry has shown greater development during recent years, so that there has been an increase of 25 per cent. of the exports of five years ago. A short sugar crop caused a fall from 5,199 tons in 1910 to 4,288 tons in 1911. The possession of good factories and the prospects of closer trade relations with Canada are considered to establish the sugar industry of the island on a firm basis.

As has been pointed out before in this journal, lime cultivation has been taken up energetically in St. Lucia, and promises to make a material addition to the exports in the near future.

A considerable output of logwood and pimento was caused by the receipt of good offers. The small cultivation of cotton continues to decline.

'On the whole the agricultural prospects are good and the present position of the Colony is one of progress.'

THE GERMINATION ENERGY OF SEEDS.

The abstract printed below is taken from the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for July 1912. The original paper appeared in *Le Stazioni Sperimentali Italiane*, Modena, Vol. XIV, p. 302:—

The valuation of the germination energy based on the number of seeds which sprout within an empirically fixed lapse of time cannot (owing to the irregular course of the germination curve for seeds of the same or of distinct varieties) give a clear idea as to the value in this respect of a parcel of seed.

It often happens that a high germination capacity is accompanied by low germination energy and that the answers furnished by different laboratories to the same questions differ so widely as to give rise to complaints on the part of the purchasers of seeds. In order to avoid this inconvenience the Author agreeing with H. Pieper (cf. Keimversuche mit Grassämereien: Dissert. Jena, 1909) proposes that germination energy be determined not on the basis of the percentage of seeds which sprout within a determined time, but on the mean time required for germination, and that it be designated by a number which represents its value exactly.

Supposing for instance that a sample on being tested for germinability had given the following results:—

After	3	days	15	seeds	germinated
,,	4	,,	50	,,	,,
,,	5	,,	20	,,	,,
,,	8	,,	8	,,	,,
,,	10	,,	2	,,	,,
			95		

Then adding together the respective products of these figures viz. $3 \times 15 + 4 \times 50 + 5 \times 20 + 8 \times 8 + 10 \times 2 = 429$; and dividing this sum by the total number of sprouted seeds, $\frac{429}{95} = 4{\cdot}5$ is obtained. Then the results of the germination would be stated as follows:—

Germination capacity	95 per cent.
Mean germination time	4·5 days.

With these two figures the seed is sufficiently characterized as regards its germination capacity. The difficulty of choosing a convenient term for expressing germination energy is avoided, as well as all those discrepancies among the results given by various laboratories, and which with the methods actually followed are almost inevitable.

The author gives the results of numerous experiments made with the object of determining the mean average time required by the seeds of the most important crops.

GLEANINGS.

It is announced that the success of the Textile Exhibition held recently at Soerabaia, Java, has led to the decision to hold a rubber exhibition at Batavia in the year 1914. This will include everything connected with raw rubber, both wild and plantation, and similar products such as balata, jelutong and gutta.

Among the exports of Peru during the year 1910-11 there were included: cocaine value £60,287, rubber (wild) 978,540 kilos. value £546,565, rubber (Sernamby de Jebe), 703,112 kilos. value £207,809, rubber (Caucho), 135,810 kilos., value £42,405, rubber (Sernamby de Caucho) 1,236,105 kilos.

A table given in the *Proceedings of the Agricultural Society of Trinidad and Tobago* for November 1912 shows that the total export of cacao faom the island during that month was 329,730 lb. The amount shipped previously was 40,143,025 lb., making a total for the first eleven months of 1911 of 40,472,755 lb.

The bulletin of the South African Department of Customs and Excise for September estimates that, on account of drought, the total output of sugar in Natal for 1912 will not exceed 100,000 tons. As there is a gradual increase in production, the consumption in South Africa will shortly be supplied, and Natal will have to become a sugar-exporting country.

With relation to the influence of molasses on soils, it is of interest that a paper in the *Journal of Industrial and Engineering Chemistry*, 1912, p. 272, describes work which showed that when sugar and molasses were added to sewage filter beds nitrification was checked. The addition was somewhat useful, however, in that it partly cleared the beds of organic matter.

In the *Dominica Gazette* for December 6, ,1912, it is shown by means of a table that the citrus exports from the island for the first eleven months of last year were as follows: citrate of lime 3,222 cwt., écuelled lime oil 979 gallons, distilled lime oil 3,862 gallons, orange oil, 80 gallons, limes 34,288 barrels and 3,057 boxes, oranges 1,348 barrels and 2,434 boxes, concentrated lime juice 127,661 gallons, raw lime juice 492,331 gallons.

A report published by the Barbados Education Board, in the *Official Gazette* for November 18, 1912, states that, as regards the subject in the curriculum for pupil teachers described as Science, the results of the recent examinations show that, as usual, very little time seems to have been devoted to the subject. The reason for this is adduced that the science paper is optional.

The *Uganda Official Gazette* for October 31, 1912, gives notice that all plants, seeds, bulbs, etc., consigned to the Uganda Government Entomologist for examination and fumigation will, in the absence of any arrangements for their clearance through the Customs, transportation and reshipment, be handed over to an agent for the purpose, and that all charges incurred in this way must be paid by the importer.

The Annual Report of the Director of Agriculture, Cyprus, for 1211-12, states that the area sown with cotton by private growers in the island has increased largely during the past two years. In one district a grower has imported a considerable quantity of Egyptian seed which he has disposed of readily to other growers. This proprietor claims that his yield of lint on seed cotton has been 33 per cent. The advice is given that earlier planting of cotton is required in the island.

The *Experiment Station Record* for July 1912 gives an abstract of work showing the effect of ether and carbon bisulphide applied to soil in which plants were growing. Ether caused a greater total yield as well as a higher amount of combined nitrogen in the plants, immediately afterwards; but in the second crop both these quantities were smaller, and sometimes less than in the controls. It seems to be shown that both these substances act in stimulating the growth of the plant, rather than that they possess any influence on the nitrifying and denitrifying organisms in the soil.

A report by the Acting British Council at Casablanca, Morocco, states that the linseed crop of the Province of Showia will be short, but that the quality will be good. At Mazagan it is reported by the British Vice-Consul that about 4,400 tons of this crop, value £66,000, has been shipped already from this port, and that about 600 tons were waiting for export. *The Board of Trade Journal* for October 31, 1912, from which these details are extracted, states that H.M. Vice-Consul at Saffi in the same country, reports that there will be a small crop of linseed of good quality this year, and that the cultivation of linseed in this district is diminishing.

Information regarding tomato seed oil has appeared in the *Agricultural News*. It seems, now, that the oil has just appeared on the market. According to the *Chamber of Commerce Journal* for November 1912, *L'Agriculture Commerciale* states that the oil comes chiefly from Italy, where in the Province of Parma alone, 600 tons of a semisiccative oil have been manufactured from the seeds of about 84,000 tons of tomatoes. The fresh fruit contains 11 per cent. of seed. In the dried residue from preserved manufacture the percentage of seed is about 66, and this residue when extracted with carbon bisulphide gives about 12 per cent. of oil. The tomato oil cake can be used for manure. Oil is also obtained from the seeds that are separated by fans from the skin, and this amounts to about 16 per cent.

STUDENTS' CORNER.

AGRICULTURAL EXAMINATIONS.

It is intended to review in this article the answers to the questions in the recent Intermediate and Final Examinations held in connexion with the Reading Courses of this Department. A similar review for the Preliminary Examination appeared in No. 276 of the *Agricultural News*, dated November 23, 1912.

Dealing first with the General Agricultural Science paper in the intermediate stage, which was reproduced in the number of the *Agricultural News* mentioned above, the first question, relating to the methods, and benefit to the soil, of tillage, educed some very fair answers; though there was weakness in the knowledge of the effects of tillage on the useful micro-organisms in the soil. No good answers to the second question were received; they all, or nearly all, failed to give attention to the very important action of the Azotobacter group of bacteria in forming a natural means of fixing nitrogen from the air in the soil, and thus making it available for plants—indirectly. The artificial means of making atmospheric nitrogen available for plants are concerned with the manufacture of such substances as nitrolim (calcium cyanamide) and nitrate of lime; more definite details should be known regarding the way in which these are made: the subject has received particular attention from time to time, in this journal. Some good answers were received to question 3. Question 4 was answered fairly, but in no case where it was attempted did candidates supply diagrams that approached the adequacy that is necessary in all such descriptions; more should be known concerning the ways in which the different parts of a stem are suited specially to do the work that is required of them. In most cases the answers to question 5 were almost complete; though the importance of rotation in regard to the nitrogen content of the soil needs greater emphasis. Question 6 was generally answered in such a way as to indicate that only very hazy ideas are, for the greater part, possessed by candidates as to the sources of the common artificial manures. Good replies were received to the first part of number 7; a large amount of latitude was permitted in the way of dealing with the second part, and students are referred to Fream's *Elements of Agriculture*, seventh edition, pp. 2-5, for a good answer. What has been said regarding diagrams, in question 4, refers to question 8. In answering such questions as number 9, careful attention should be paid to the effect of waterlogging in soils, on the bacteria that are harmful, as well as on those that are beneficial, from an agricultural point of view. Question 10 was rarely answered at all well; the information required is supplied usefully in the work just mentioned, beginning at page 349, although in answering the question it was sufficient to mention, instead of describing, the uses of the various soft parts of an animal. The question on insects (number 11) received answers better than have been given usually to this kind, and they made it appear that the issue of *Insect Pests of the Lesser Antilles* has enabled pupils to carry out their observations on insects in a much more detailed and efficient manner. The last question in the paper received poor attention, and students will be well advised to pay more attention to plant diseases.

In the special crop subjects of the intermediate stage, some very good answers were submitted in all the divisions of the paper. Sugar Industry—General showed weakness regarding the manuring of sugar-cane, sugar-cane nurseries, the classification of canes, the manner of production of ratoons (see *West Indian Bulletin*, Vol. X, p. 117), and the profitable extent of ratooning. Some of the best answers were given to question 2. Weaknesses in the Cacao section were mainly shown respecting die-back of cacao, the manuring of cacao, the general, seasonal work on a cacao estate and varieties of cacao. It seemed, in connexion with question 5, that it is not well understood that the term 'crop season' should be taken to include all the time and activities that are required for the complete production of a crop, including the preliminary preparations before that crop commences to appear; it is not restricted to the time of harvesting, or picking. As regards Limes, more attention is required respecting insect pests, lime nurseries, the packing and marketing of lime products, and the testing of lime juice. There was a general good knowledge of the manufacture of lime products and by-products. In the last section of this paper—Cotton—more practice is still wanted in the examination of samples of seed cotton; the results should be tabulated properly, and anything like guesswork (unless it is stated distinctly that a mere estimate has been made) should be carefully avoided. Other weaknesses related to the manurial treatment of cotton (the results of practical observation—not what is read in books, only—are required), the by-products from cotton growing, and the action of the Sea Island cotton gin. Regarding the last, the student should examine carefully a gin of the kind, and obtain an explanation of its action from one who is familiar with its working; he will be helped by reference to Pamphlet No. 60 of the Department Series.

There was only one candidate in the Final Examination so that, with papers giving so great a choice of subjects there is little scope for reviewing the questions in the light of the answers given to them. It may be said that it is especially important in this stage (as well as in the intermediate) that candidates should bring their practical experience to bear upon their answers to the questions, to as great an extent as is possible. A very wide discretion is exercised in examining the answers, and in the case of both the stages mantioned, these are considered very particularly in relation to the results of, and reports on, the oral examinations. The result has been that it is often found that the want of ability to express themselves, in both intermediate and final candidates, has sometimes prevented them from doing themselves justice in the written tests, and reference to the reports of the oral examiners has enabled the examiners at the Head Office to find that the candidate actually knew much more about certain subjects than he was able to express readily in writing. Practice in answering questions in an explicit and orderly way is of the greatest importance—not only in connexion with examinations, but in a much broader way, for the purposes of ordinary life and work.

In the *Bulletin of Entomological Research*, for November 1912, appears a paper entitled 'Some Observations on the Bionomics and Breeding-places of Anopheles in Saint Lucia, British West Indies, by Lucius Nicholls, B.A., M.B., B.C. (Cantab.), Government Bacteriologist in that Presidency. The observations concern two common local species of malaria-carrying mosquitos, *Anopheles argyrotarsis* and *A. albimanus*. The paper is well illustrated with drawings and photographs and the conclusions arrived at are logical and practical, and the whole paper constitutes a valuable addition to preventive medicine in the Tropics. It will receive further attention, at greater length, in this journal.

FUNGUS NOTES.

A NEW GROUP OF FUNGI ON SCALE INSECTS,

In the *Annals of Botany*, Vol. XXV, No. XCIX, p. 842, there appears an interesting note by Petch entitled Note on the Biology of the Genus Septobasidium. The writer points out that in this genus are included a fairly well defined group of Basidiomycetous fungi formerly classified under the genera Thelephora, Corticium and others related to these. The members of the group occur mainly in tropical countries and are found as a rule encrusting the living branches and leaves of plants up to a height of 10 feet or more from the ground. The variously-coloured sheets of fungus often cover these parts for a distance of several feet, but they never kill them or cause any noticeable injury. The question therefore that naturally arises is upon what do these fungi live, since they do not appear to be parasitic on the plants on which they grow.

From an examination of a long series of specimens, Petch concludes that they are parasitic on scale insects, not, as in the case of the well-known local forms, on individuals, but upon whole colonies. This fact is of considerable interest from a local point of view, because at least two species of the genus Septobasidium occur fairly commonly in these islands. The first is one described under the name *Thelephora pedicellata*, in the *Agricultural News*, Vol. IX, p. 286. It is very common on lime trees in St. Lucia and forms violet-grey, waxy patches on their branches; the patches are often of considerable extent. In the description referred to it is stated that the presence of the fungus is often associated with the death of the parts affected; but it is also true that very frequently, as recent examinations have shown, the fungus may be present in large quantities without causing any apparent injury. The association of this fungus with scale insects that looked healthy is also recorded in the same place, but almost certainly the presence under the older parts of the fungus of numerous dead insects was overlooked. It appears, therefore, that this fungus which is so universal in the island mentioned is not harmful but useful; and that when the parts of the trees upon which it is growing die, their death is due to some other cause, very possibly the harmful effect of the scale insects brought about before the fungus has had time to overcome them. Another species, almost certainly belonging to the same genus and having probably the same parasitic habit on scale insects, forms dark-brown sheets also on lime trees and covers colonies of scale insects in the same way as that first mentioned. It has been found in Antigua and Dominica, but has not yet been identified. It seems quite possible that one or two other species of the same kind may exist in the West Indies.

A MEANS TO PREVENT CROSS-POLLINATION IN COTTON EXPERIMENTS.

This is described in the *Annual Report of the American Breeders' Association*, Vols. VII and VIII, lately received. It was devised after the trial of several methods, including the use of the paper bag, in work to obtain strains of cotton resistant to wilt disease (Fusarium). It may be said that somewhat similar methods using lengths of worsted in place of the copper wire have been employed by the Imperial Department of Agriculture, and that it has been suggested by this Department to use small rubber bands in the same way.

The method finally adopted consists in winding the flower bud loosely with very fine flexible copper wire. The operation is performed when the flower has attained nearly full size but before it has begun to open at the tip. The wire used was No. 26 soft copper, which comes in 260-foot rolls costing about 20c. It can readily be cut into desired lengths of 6 to 8 inches with a pair of small scissors. The flower bud is held very carefully in the left hand, the bracts of the involucre being turned back with the thumb and finger, while one end of the wire is very lightly hooked through the corolla at the thickened portion near the base just enough to hold it, extreme care being taken not to go too deep and thus injure the interior flower parts. The end of the wire thus inserted is allowed to protrude about $\frac{1}{2}$-inch and is then turned over with the finger. This part of the operation must be done very carefully to avoid tearing the delicate corolla. With the finger still on the end of the wire the remainder is loosely wound spirally around the flower from base to tip, the spirals at the base being $\frac{1}{4}$- to $\frac{3}{8}$-inch apart and gradually becoming closer and smaller toward the tip until the spiral is closed just above the top of the bud.

As the cotton flower increases in length very rapidly during the last twenty-four hours before it opens, the buds are not in the best condition to work with until five or six o'clock of the evening before the day on which they are to open. The work must therefore be done after 5 p.m., and before 8 a.m. of the following day, since by this time on the morning of a sunny day in July or August the tips of the flowers begin to open sufficiently to allow small insects to enter. Bees have been seen forcing flowers open before this time in the morning, and entering to obtain honey.

There is sufficient elasticity to the coiled pliable copper wire to permit the normal development of the flower parts, but in no case has a wired flower been seen to open to allow an insect to enter. In fact, the slight growth that takes place after the flowers are wired forces the tip of the corolla into the end of the closed spiral and effectively seals it to the entrance of even the smallest insects.

After one gets the knack of the operation it can be done very rapidly and with little or no injury to the flowers. First the field is gone over and the best plants are selected and tagged conspicuously with white or bright-coloured cloths so that they may be readily seen, and then from day to day the flowers are wired and tagged as they reach the right stage of development.

The conditions under which the work was done render the results in percentage of blooms finally harvested not at all comparable with results secured elsewhere where no disease factor is present. In the first place, it is not possible as early as July or the fore part of August, the time when inbreeding must be done, to determine which plants will later succumb to the wilt disease, since many plants, apparently in full vigour in late July, are entirely dead by September. Furthermore, neither the size of boll nor the length of lint can be determined at this time, as no bolls are matured. It is therefore necessary to select a large number of what then appear to be the most vigorous, productive, wilt-resistant and otherwise desirable plants and make a very much larger number of inbreeds that are eventually desired. Hence the necessity for a rapid method

In 1910, 1,377 blossoms on 170 plants were inbred by the copper-wire method. After taking into account the considerable number of selected plants that were later killed or stunted by the wilt, and all the inbred bolls on each of these plants, sometimes as many as a dozen, the even larger number of plants eventually discarded because of too small bolls or too short lint, the final harvest of 357 bolls was made from 105 plants. In other words, 26 per cent. of the original number of flowers wired produced bolls, which were harvested. But sixty-five plants were discarded altogether, and estimating the number of wired flowers on each of these to be equal to those on the plants saved, there were 853 flowers wired on the 105 plants finally saved, and 357 of these, or 42 per cent. produced bolls. No record was kept of the total number of bolls which finally matured on wilted and discarded plants.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

The month of November began with a restricted business and a certain amount of depression, in view of the possibilities of the war in the Balkan States affecting indirectly products other than those of the countries actually engaged in hostilities. In the middle of the month trade was marked by a very slow demand for drugs, many of which continue to advance in price, such as glycerine, cocaine, eucalyptus oil, menthol, kola, nutmeg oil, and others. Towards the end of November there was a better tone and more activity.

In West Indian produce nothing calls for special mention except the continued scarcity of kola, and the consequent advance in prices.

GINGER.

At the first Spice Auction on the 6th, the offerings were 400 bags of Cochin, 51 of which sold without reserve at 28*s.* to 28*s.* 6*d.* for washed rough wormy; 40 bags of Japan were also disposed of without reserve at 24*s.* 6*d.* to 25*s.* for limed. On the 13th as many as 636 packages of Cochin and Calicut were offered, and all bought in at the following rates: A cut 75*s.*, B cut 77*s.* 6*d.*, C cut 55*s.* and D rough 35*s.* Washed Cochin were also held at 36*s.* to 40*s.* Some 69 bags of limed Japan, were further bought in at 27*s.* A week later, namely on the 20th, the offerings consisted of 47 bags of Jamaica and 215 bags of Cochin, the former being bought in at 52*s.* per cwt. for dull small washed, and the latter at 37*s.* for washed rough. At the last auction on the 27th some 69 bags of limed Japanese were disposed of without reserve at 22*s.* 6*d.* to 23*s.* Four hundred and seventy bags of Cochin and Calicut were brought forward and reserved at 37*s.* for washed rough, 28*s.* for wormy, and rough brown Calicut at 42*s.* 6*d.*

NUTMEGS, MACE, PIMENTO, AND ARROWROOT.

There has been a steady demand for nutmegs throughout the month At the first spice auction on the 6th, 797 packages of West Indian were offered, and nearly all were disposed of at the following rates. 57's to 68's 7½*d.* to 9½*d.*, 70's to 78's 6½*d.* to 7½*d.*, 94's to 104's, 5¾*d.* to 7*d.*, 117's to 126's 5¾*d.* to 6½*d.*, 142's to 150's 5¾*d* to 6*d.* On the 19th 293 packages of West Indian were brought forward and sold at ¼*d.* to ½*d.* per lb. decline. At this auction 94 packages of Java were also offered and sold. At the last sale on the 27th 292 packages of West Indian were offered and sold at somewhat easier rates. For mace there has been a steady demand throughout the month. At the first spice auction 197 packages West Indian were offered, and all but one sold at 2*s.* 1*d.* to 2*s.* 5*d.*, broken fetching 1*s* 8*d.* to 2*s.* 1*d.* per lb. A week later there was no West Indian offered, but 18 cases of Java were sold at 2*s.* 4*d.* per lb., for fair pale and reddish; on the 20th the offerings were 31 packages of West Indian and 14 of Java: 20 of the former were disposed of at 2*s.* 1*d.* to 2*s* 2*d.* for fair red, part broken, and 1*s.* 10*d.* to 2*s.* 1*d.* for broken. The 14 cases of Java fetched 2*s.* 2*d.* per lb. for small early and 2*s.* 6*d.* for bold flat red. At the last sale on the 27th 62 packages of West Indian were brought forward and disposed of at the following rates: fine bold pale at 2*s.* 9*d.*, reddish and pale 2*s.* 2*d.* to 2*s.* 3*d.*, fair reddish 2*s.* 1*d.* to 2*s.* to 2*d.*, broken and pickings 1*s* 9*d.* to 2*s.* per lb. Of pimento 33 bags were offered at auction on the 13th, and 13 sold at 2½*d.* per lb. On the 20th 90 bags were sold without reserve at 2¼*d.*, one lot fetching only 2⅜*d* per lb. At the last sale on the 27th, 162 bags were offered and bought in at 2¾*d.* per lb. On the 20th 20 cases of Natal arrowroot were brought forward, five of which were sold at 9*d* per lb.

SARSAPARILLA.

This article has not occupied a large share of attention during the month. At the drug auction on the 14th the offerings were 16 bales of Grey Jamaica and 5 bales of Native Jamaica; only 6 bales of the former were sold, 1*s.* 10*d.* per lb. being paid for fair fibrous; none of the native Jamaica was disposed of 1*s*, 2*d.* being the price asked for it. At auction on the 27th 16 bales of Grey Jamaica, 23 of Native Jamaica, and 3 of Lima Jamaica were offered; of the former only 3 bales were disposed of, and of the second 5 bales and third 3 bales. 1*s.* 7*d.* to 1*s.* 8*d.* was paid for part rough to fair fibrous Grey Jamaica, while Native Jamaica sold at 1*s* 1*d.* to 1*s.* 2*d.* for fair red; 10½*d.* for dull red, and 6*d.* for inferior yellow and grey mixed For 3 bales of Lima Jamaica, part chumpy to fair 1*s.* 6*d.* to 1*s.* 7*d* per lb. was paid.

KOLA, LIME OIL, LIME JUICE AND TAMARINDS.

At the drug auction on the 14th kola was represented by 32 packages, one of which a single bag of Dominica halves, fetched 4¾*d.* per lb.; the other 31 packages realized from 4¾*d.* to 5*d.* per lb. for fair dried Jamaica halves and whole nuts; 4¾*d.* was also paid for some mouldy and part wormy. In the last week 31 bags of West Indian were brought forward, 17 of which were sold, fair dried halves and whole seeds fetching 4½*d.* to 5*d.* and mouldy 4¼*d.* Of lime oil it was announced at auction on the 20th that several shipments had arrived from Dominica consisting of about 86 cases; 1*s.* 3*d.* per lb. was the price at which fair West Indian was offered. A week later 7 cases of white distilled were sold at 1*s.* 2*d.* per lb.; hand-pressed was bought in at 7*s.* 3*d.* Of 12 packages of brown West Indian lime juice brought forward on the 27th of the month, two were sold at 8½*d.* per gallon. With a fair demand for Tamarinds, fair West Indian were quoted at 12*s.* 6*d.* per cwt. in bond.

In connexion with the subject of the supply of Buchu leaves (*Barosma* spp. described on p. 362 of the *Agricultural News* November 9th last, it may be of some interest to say that for the demand during the month of November has shown a slight falling off, with a consequent reduction in the prices obtained. Of 47 packages offered at the drug auction on the 28th November only three were sold, round green leaf of fair quality being bought at 6*s.* 6*d.* per lb. One bale of good long green, which was reported to be exceedingly scarce, was sold at 5*s.* per lb.

MARKET REPORTS.

London.—The West India Committee Circular, December 17, 1912; Messrs. E. A. de Pass & Co., December 6, 1912.

Arrowroot—4*d.* to 4¼*d.*
Balata—Sheet, 3/6 ; block, 2/8 per ℔.
Beeswax—£7 15*s.* to £7 17*s.* 6*d.*
Cacao—Trinidad, 69/6 to 80/- per cwt. ; Grenada, 59/- to 66/-; Jamaica, 56*s.* to 65*s.*
Coffee—Jamaica, 72*s.* to 85*s.*
Copra—West Indian, £27 15*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 15*d.* to 18½*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—48*s.* to 65*s.*
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 10*d.* to 1/1½; concentrated, £18 5*s.* to £18 10*s.*; otto of limes (hand-pressed), 7/4½.
Logwood—No quotations.
Mace—Quiet.
Nutmegs—5*d.* to 6*d.*
Pimento—2⅛*d.* to 2$\frac{7}{16}$*d.*
Rubber—Para, fine hard, 4/7-; fine soft, 4/3½; Castilloa, 3/10 per ℔.
Rum—Jamaica, 2/1 to 6/-.
Sugar—Crystals, 18/- to 20/-; Muscovado, 11/6 to 14/6; Syrup, 10/3 to 15/6; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., December 13, 1912.

Cacao—Caracas, 15c. to 15½c.; Grenada, 14c. to 15c; Trinidad, 15c. to 15¼c. per ℔.; Jamaica, 11¾c. to 12½c.
Coco-nuts—Jamaica, select, $33·00 to $34·00; culls, $19·00 to $20·00; Trinidad, select, $33·00 to $34·00; culls, $19·00 to $20·00 per M.
Coffee—Jamaica, 15¼c. to 16⅜c. per ℔.
Ginger—8¾c. to 12c. per ℔.
Goat Skins—Jamaica, 58c.; Antigua and Barbados, 46c. to 48c.; St. Thomas and St. Kitts, 43c. to 46c. per ℔.
Grape Fruit—Jamaica, $1·50 to $2·00.
Limes—$5·00 to $5·75.
Mace—50c. to 52c. per ℔.
Nutmegs—110's, 14c.
Oranges—Jamaica, $1·25 to $1·75.
Pimento—4¼c. per ℔.
Sugar—Centrifugals, 96°, 4·05c. per ℔.; Muscovados, 89°, 3·05c.; Molasses, 89°, 3·30c. per ℔., all duty paid

Trinidad,—Messrs. Gordon, Grant & Co., December 23, 1912

Cacao—Venezuelan, $15·50 per fanega; Trinidad, $14·50 to $15·00.
Coco-nut Oil—99c. per Imperial gallon
Coffee—Venezuelan, 15c. per ℔.
Copra—$4·25 per 100 ℔.
Dhal—$4·00.
Onions—$1·50 to $3·70 per 100 ℔.
Peas, Split—$5·75 to $6·00 per bag.
Potatoes—English, $1·25 to $1·50 per 100 ℔.
Rice—Yellow, $5·00 ; White, $6·75 to $7·00 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., December 28, 1912; Messrs. T. S. Garraway & Co., December 30, 1912.

Arrowroot—$6·75 to $9·00 per 100 ℔.
Cacao—$9·50 to $12·00 per 100 ℔.
Coco-nuts—$20·00.
Hay—$1·60 to $1·80 per 100 ℔.
Manures—Nitrate of soda, $75·00; Cacao manure, $45·00 to $48·00; Sulphate of ammonia, $80·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$6·00 per 100 ℔.
Peas, Split—$6·40 per bag of 210 ℔.; Canada, $3·00 to $4·50 per bag of 120 ℔.
Potatoes—Nova Scotia, $2·75 to $3·00 per 160 ℔.
Rice—Ballam, $5·10 to $5·15 per 190 ℔.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $4·75 per 100 ℔.

British Guiana.—Messrs. Wieting & Richter, December 21, 1912.

ARTICLES.	Messrs. Wieting & Richter.
Arrowroot—St. Vincent	——
Balata—Venezuela block	No quotation
Demerara sheet	72c. per ℔.
Cacao—Native	18c. per ℔.
Cassava—	$1·00.
Cassava Starch—	$7·50 to $8·00
Coco-nuts—	$16 to $20 per M.
Coffee—Creole	17c. per ℔.
Jamaica and Rio	20c. per ℔.
Liberian	16c. per ℔.
Dhal—	$3·50 to $4·00 per bag of 168 lb.
Green Dhal	$5·00
Eddoes—	60c. to 80c.
Molasses—Yellow	None
Onions—Teneriffe	——
Madeira	7c. to 8c. per ℔.
Peas—Split	$7·00 to $7·50 per bag (210 ℔.)
Marseilles	——
Plantains—	16c. to 48c.
Potatoes—Nova Scotia	$2·75
Lisbon	——
Potatoes-Sweet, B'bados	$2·64 per bag
Rice—Ballam	No quotation
Creole	$4·50 to $5·00
Tannias—	$1·68
Yams—White	$2 64
Buck	$2·40
Sugar—Dark crystals	$2·20 to $2·50
Yellow	$3·00 to $3·25
White	$4·00
Molasses	$2·30 to $2·60
Timber—Greenheart	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.
,, Cordwood	$1·80 to $2·00 per ton

Publications on sale of the Imperial Department of Agriculture

FOR THE WEST INDIES.

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Division of Labour.

DIVISION OF LABOUR is the outcome of human propensity to barter and exchange. As was pointed out by Adam Smith, this propensity is common to all men and is to be found in no other race of animals. 'Nobody', says Adam Smith, 'saw a dog make a fair and deliberate exchange of one bone for another with another dog; nobody ever saw one animal by its gestures, and natural cries signify to another, this is mine, that yours—I am willing to give this for that.' Nevertheless, the term division of labour has an application in biology for denoting a condition of co-operation such as that exhibited by a colony of ants or by the composite inflorescence of the sunflower. But this use of the term is physiological, and should be distinguished from the economic application which constitutes the theme of the present article.

Few persons can be unacquainted with the simple development of division of labour in the primæval tribe of hunters, in which one man finding that he could make bows and arrows with greater readiness and dexterity than his companions, concentrated his energies in this direction and bartered and exchanged the surplus products of his specialized labour for venison and hide, the unspecialized products of the general activities of his tribe. Another hunter found that he excelled in constructing the little huts or movable houses, and so settled down to this specialized line of work, eventually becoming a sort of carpenter, just as the maker of bows and arrows came to be regarded as a kind of armourer. Further evolution of this nature necessitated the establishment of villages with their little shops; and general progress and development, resulting mainly from competition, from the development of natural resources, and communication with the outside world, led gradually to the establishment of those large centres of industry, with their highly skilled labour, which constitute the characteristic feature of modern times.

Although this development of division of labour has in the past been confined chiefly to the manufactures and higher intellectual work of men of science and philosophy, yet it has not been entirely absent from agriculture, and its encouragement in the rural industries of to-day is one of the outstanding duties of agricultural economists. But before viewing the subject in this aspect, it may be well to enquire into the benefits that are considered to arise from a wise division of labour generally.

Division of labour in any undertaking increases the amount of work done, always provided there is sufficient work to keep each individual continuously employed. Thus there are two conditions for the economic employment of the system: efficiency of labour, and sufficiency of work to be done. One of the more obvious advantages of division of labour is contained in the proverb, 'practice makes perfect', and, even in agriculture, the truth of this statement is too well known to require illustration. The second advantage lies in the fact that a loss of time is involved when the same worker is continually removed from one task to another of a different nature. There is, however, a compensatory influence in that a change of work lessens the monotony of existence; but, from the employer's point of view, at all events, this objection to specialization is considered to be more than counterbalanced by the higher rate of wages which specialized skill always demands.

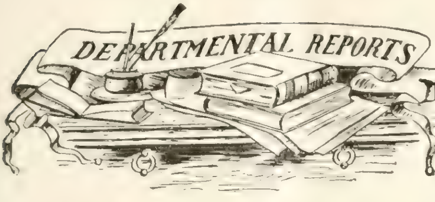
Lastly, one has to recognize in division of labour one of the chief indirect causes of the evolution of labour-saving machinery. The intelligent workman confined to one particular series of operations is continually on the alert to discover and apply some means of reducing the physical and mental strain which his task involves; this attitude led to the invention of the slide valve of the steam engine, and to numerous devices in the spinning and weaving industries. A similar attitude in agricultural labour is greatly to be encouraged, and this leads to considerations of division of labour in its direct bearing upon agricultural progress.

The fundamental difference between agricultural production and the manufacturing industries lies in the fact that agriculture, perforce, covers the broad land; raw material can be brought to the manufacturer for him to work upon, but the agriculturist must seek his work. Moreover, the agriculturist is forced to adapt his work to the seasons which makes specialization in labour a matter of difficulty. Again, he has little chance of forecasting fluctuations in the demand for produce or in the supply of labour, and even if he had, the nature of his work renders it impossible for him to respond as quickly to these changes as can the manufacturer.

In spite of these difficulties there are forces tending to organize agriculture in an industrial way, and a more definite division of labour must be one of the ultimate results. The more extensive employment of agricultural machinery is one tendency which stimulates division of labour. The improvement of machinery with a reduction in price, the introduction of interchangeable parts, the various systems of joint ownership, all render the employment of labour-saving devices a normal development in modern agricultural progress. A demand is created, broadly speaking, for men who can be trusted with responsibilities. The rapid increase of knowledge concerning general estate administration, the scientific feeding of live stock, the control of plant diseases, the rotation, manuring and selection of plants, and the grading and packing of produce for distribution, have for many years been creeping into the regular routine of the ordinary estate, and this is now beginning to call for practical men of the artisan type with special skill in one or another of these different directions.

But that in agriculture which lends itself most readily to division of labour is any system of co-operation in which the scale of production is sufficiently large to provide a continuous supply of specialized work. Not only do such schemes uplift the labourer, but they tend to draw into agriculture men of high administrative ability who have hitherto sought their earnings of management in the manufacturing industries of large cities.

The modern tendency in established countries is in the direction of running large estates with specialized labour, or else small holdings on which an owner with limited capital performs his own manual work In the case of the latter class, division of labour shows itself in the co-operative schemes which are necessary for the collection and distribution of the produce. The establishment of co-operative societies, of agricultural banks, of the various central factories for dealing with sugar, cotton and dairy produce, characterize the bringing of modern agriculture into the state of the more organized industries; and although such concerns as these do not directly bring about division of labour on the land itself, they have a stimulating effect, and certainly put a check upon rural depopulation. Not the least benefit derived from their institution is the fact that they bridge the gap that previously separated the agriculturist from the wholesale markets in the great industrial centres of consumption.



ST. LUCIA: REPORT ON THE AGRICULTURAL DEPARTMENT, 1911-12.

In the letter of transmittal of this report reference is made to the alteration in the arrangement of the subjects, which will in future take the place of the headings used formerly. The effect of this alteration is to bring forward prominently the main activities of the stations, and to place details of administration and similar affairs where they will be useful for record without detracting from the interest of the report.

Attention is first directed to work in the Botanic Gardens, and several useful facts are recorded which should prove of interest not only to the planting community, but also to the general public. The method of establishment of new lawns, the suitability of Pelargoniums for ornamental purposes during dry seasons, the successful cultivation of new ornamental perennials like *Fagraea zeylanica*, are examples of this kind of general information.

The section on the raising and distribution of economic plants refers to the increased distribution of lime seedlings, and useful experiments are described in connexion with the germination of imported Hevea rubber seeds. Work has also been carried out with regard to the budding of the mango.

As regards plant importations, several exotic species of Phoenix and Eucalyptus have been received, besides seed of various kinds forwarded by the Imperial Department of Agriculture, and other departments in the tropics.

The economic use of the Gardens is chiefly made manifest by the trials with various green dressings that have been conducted during the year under review. The Lyon bean (*Stizolobium niveum*), the Bengal gram (*Cicer arietinum*), *Tephrosia candida* and *T. purpurea*, and the well-known horse bean (*Canavalia ensiformis*), have been grown experimentally, their capacity for keeping down weeds being a factor to which much attention has been paid. Attempts are also being made to raise local seedling sugar-canes.

At the Experiment Station, Union, the grafting of the mango and of cacao has received special attention. In the case of cacao, Calabacillo is the most commonly employed stock on which the less hardy Forastero is grafted. Para seedlings have been raised during the year, but the growth of already established plants has been somewhat disappointing. In the budded orange plot, Washington Navel, St. Michael's Blood and other well-known varieties are being raised for bud wood. As regards limes, useful information has been collected relating to the highly beneficial effect of direct sunlight on the trees; and finally this section refers again to the trouble and expense that have been caused during the past year by the rapid growth of weeds, chiefly Johnson grass (*Sorghum halepense*).

The matter relating to work connected with plant pests and diseases covers a wide range, but no serious outbreaks are recorded. The root disease of cacao continues to cause considerable anxiety, particularly because of the large number of different hosts the causative fungus attacks. The red rot of the sugar-cane (*Colletotrichum falcatum*) appears to be causing some loss, but a remedy lies in substituting disease-resistant varieties for the at present widely cultivated Bourbon. Other diseases and pests of various plants are: a fungus disease of the banana, suspicious cases of bud rot of the coco-nut (in regard to which a warning has been issued), a disease of the Lyon bean and a leaf bug on tobacco. It is gratifying to note the continued spread of the white-headed fungus (*Ophionectria coccicola*) and the red-headed fungus (*Sphaerostilbe coccophila*). The latter seems to be parasitic on the burrowing scale (*Howardia biclavis*).

Progress in the chief industries, namely sugar, cacao and limes, appears to be satisfactory. The somewhat reduced output of sugar has been caused by the adverse effect of floods upon the growing crop The output of cacao has been 10,368 bags, being 487 short of the figures in 1909. It is stated, however, that comparisons of the kind are scarcely justifiable, since the calendar year does not coincide with the crop period.

The increased cultivation of limes during recent years has constituted the chief feature of progress in the agriculture of St. Lucia; and although it is stated that the number of plants distributed from the nurseries shows a decrease compared with the previous year's figures, this decline is only apparent, and is explained by the fact that use has been made of plants raised on the estates on which extension has chiefly been made in the past.

As regards the minor industries, reference is made to the declining interest in cotton-growing. The cultivation of European vegetables for local consumption receives noteworthy attention from many of the peasantry, and the example set by St. Lucia in this respect might well be followed in several of the other islands. The remainder of the report deals chiefly with instruction in agricultural matters. A comprehensive report on the cacao Prize-holdings Competition, by the Assistant Agricultural Superintendent, describes the progress that has been made in this direction. It is stated that a keen spirit of competition has been aroused, and that the steady improvement in the work done has been greatly due to the activities of the Agricultural Instructor, who is continually in contact with the competitors.

In contrast to the keenness displayed by the small holders, is the apathy toward the scheme for training agricultural pupils at the Botanic Station. The nature of the instruction is described in the report under review, and it is not too much to say that in few European countries are such facilities available, as in St. Lucia, for learning, free of all cost, the fundamental principles and operations of horticulture.

The agricultural teaching in the primary schools, on the other hand, appears to be remarkably progressive. This is partly the outcome of the arrangement by which the teaching receives the co-operation of the Agricultural Department. The recent annual oral examinations by the Junior Instructor, under the direction of the Agricultural Superintendent, constitute one of the best tests of solid progress, and the following results taken from the detailed report submitted by the official examiner is indicative of the extent of this progress: 'of the seventeen schools examined, seven obtained over 75 per cent. of marks; seven obtained marks between 50 per cent. and 75 per cent.; whilst three obtained not less than 43 per cent.'

The report concludes with a reference to the special investigations of the agricultural officers, detailed accounts of which have appeared in the *West Indian Bulletin*, or in the *Agricultural News*. Details of administration are also described, and the report ends with meteorological returns of considerable local interest and value

FRUITS AND FRUIT TREES.

ROBUSTA COFFEE.

This coffee was dealt with at some length in an article on pages 132 and 133 of Volume X of the *Agricultural News*. The following additional information is taken from the *Bulletin of the Imperial Institute* for October 1912:—

CHARACTERS OF THE PLANT. In certain vegetative characters, *C. robusta* would seem to occupy the same relative position with regard to *C. liberica*, as does that species to *C. arabica*. Robusta coffee grows more rapidly than Liberian, a plant eight months old being much taller and possessing more branches and leaves than Liberian coffee twelve months old. The plant is of a more robust habit, and the leaves, though variable in size, are larger than those of *C. liberica*, but thinner and of a lighter green colour. The branches, however, have a tendency to bend downwards, so that the bush becomes somewhat umbrella shaped. Like *C. liberica* the plant flowers throughout the year, the flowers being intermediate in size between those of the species named and of *C. arabica*. Perhaps the most striking feature of Robusta coffee is the large number of berries borne in the numerous thick clusters, each of which contains on an average forty to sixty berries, though larger numbers are frequently met with. The berries are much smaller than in Liberian coffee, but, since the pulp is thinner, the beans are not markedly different in point of size from those of *C. arabica*. Gallagher states that on an average 10 cwt. of Liberian berries give 1 cwt. of marketable coffee, while only 4 cwt. of Robusta berries are required to yield the same amount. In the case of the latter coffee, many more berries go to the hundredweight than is the case with Liberian coffee, but the greater number on the branches renders the picking 'if anything cheaper'. The red pulp is easily removed, as is also the thin parchment.

QUALITY OF THE COFFEE. Considerable variation is to be found in the opinions expressed as to the quality of Robusta coffee, but it is not improbable that such differences are in some measure to be explained as a result of different methods of preparation, not all of equal excellence. It is stated that the beans do not possess a first class colour, and that for the first two crops a good aroma is lacking. Dr. Wildeman affirms that the flavour recalls that of Liberian coffee, but with less aroma. Hart compared Robusta coffee with the coffee of Costa Rica and the East Indies; while, according to Cramer, the quality of well-prepared Robusta coffee is approximately that of middling Arabian coffee. The beans possess a bluish green colour, similar to that of the Arabian product, but they are of a somewhat different shape, being larger and more convex on the curved side.

In preparing Robusta coffee for consumption it is necessary that the beans should be well roasted, and it is stated that the coffee loses less weight during this process than is the case with other kinds.

INTERESTING FACTS CONCERNING THE PINE-APPLE.

The Hawaiian Agricultural Experiment Station has issued recently Bulletin No. 28, dealing with the effect of manganese in the soil on pine-apple plants, and the ripening of the pine-apple fruit. A summary at the end of the publication is reproduced here:—

The root system of pine apples is very variable and particularly sensitive to adverse soil conditions. When grown in manganiferous soil the roots are less extensive and the ends of the roots are characterized by the development of swollen tips, the appearance of which seems to mark the cessation of the lateral growth of the roots, death and decay immediately following their development. The cells immediately beneath the epidermis of the roots are also somewhat more brown than are normal roots.

The stem of pine-apples serves as a repository for starch and contains large amounts of this substance.

The leaves of pine-apples in common with other members of the Bromeliaceae contain several rows of palisade cells which contain nothing but cell sap, and the chlorophyll is confined to the spongy parenchyma in the lower three-fifths of the leaf. The fruit contains only faint traces of starch during early growth, and when it reaches maturity starch is absent from it.

The most conspicuous effect of manganese on this plant is seen in the bleaching of the chlorophyll which first begins to fade, the chloroplasts lose their organized structure, and later the colour disappears altogether. Oxalate of calcium is much more abundant in pine apple plants growing on manganiferous soils. The ash of such plants also contains considerably more lime and less phosphorus pentoxide and magnesia than when grown on normal soils.

During the growth of the fruit relatively small amounts of sugars are stored in it, but within the short period of normal ripening there is a rapid accumulation of sugars in the fruit. Pine-apples gathered green do not develop a normal sugar content in subsequent ripening. The sugars of the fruit are derived from the starch previously stored in the stalk.

The study of the pine-apple shows that it is exceedingly sensitive to adverse physical and chemical conditions in the soil. So far as is known at present, there is no really satisfactory programme by which pine-apples can be grown on highly manganiferous soils. It seems best to use such areas for other crops less sensitive to manganese. The best method of handling pine-apples on manganiferous soils consists in applying soluble phosphates and planting old stumps instead of suckers.

AGRICULTURAL PROGRESS IN THE PHILIPPINES, 1911.

EXPORTS. The export trade for 1911 was valued at £9,289,020, an increase of £824,757. The increase is due to larger exports of sugar to the United States and of copra to Europe. Hemp and cigars show a decline.

COPRA. The year 1911 shows a still further increase in the production of copra and a corresponding decrease in the manufacture of coco-nut oil for local consumption. As in former years the largest purchaser was France. Increased shipments went to the United Kingdom, United States, Belgium, Spain and Japan. The Netherlands, Mexico and Hong Kong appeared as new buyers. Germany and Italy both took less.

The increasing price of the staple has given a great impetus to the industry, and much land is being sought for the purpose of coco-nut cultivation. The demand, however, still keeps pace with the supply.

HEMP. The export of hemp further declined, being 146,208 tons, valued at £3,025,036, in 1911, compared to 160 595 tons, valued at £3,432,358 in 1910. The hemp situation is causing serious thought amongst both producers and merchants. Efforts are being made to improve the quality by introducing better methods of collection and purchase in the provinces. This matter has the attention of the Hemp Association. The United States took considerably less than in 1910. Manila hemp, handicapped by the exportation tax, cannot compete with the Mexican sisal. Attempts are now being made to get this tax removed. As regards grade, a certain improvement was shown, but so long as the present prices for low grade continue, little increase in this line can be expected.

KAPOK. Philippine kapok was for the first time an article of export; the total quantity exported was 119 tons. The United States was the principal buyer at from 32 to 34c. gold per lb., c.i f. New York. In time the supply from the Philippines should increase. [More general information regarding kapok or silk cotton was given recently in the *Agricultural News*, Vol. XI, p. 324.]

MAGUEY. The export of this fibre increased over that in 1910. The United Kingdom took an increased quantity, while other buyers were France, Germany, the Netherlands, Spain and British India.

SUGAR. The quantity exported was 205,392 tons, the highest since 1896. The largest amount went to the United States. The prices obtained were fair, averaging about 6 pesos 50c. basis 88° Iloilos to July, when the shortage in the European beet crop put up values of all sugar, and transactions were made at 9 pesos for the said grade in August.

The quantity of sugar, however, then held was small, and chiefly in the hands of the export houses and middlemen. Thus the planters did not derive much benefit from the phenomenal rise in prices.

Capital is being attracted to this industry, thus facilitating the establishment of larger sugar centrals. In general the system of cultivation and polarization is still antiquated, and the gradual introduction of modern methods will increase both quality and output.

The year 1912 crop shows a considerable falling off in quantity owing to the prolonged drought since last October.

TOBACCO, UNMANUFACTURED. The export in this trade increased, the bulk going to Spain as usual. Nearly all European countries, except Austria-Hungary, increased their purchases.

CIGARS AND CIGARETTES. The trade in cigars, while showing an increase over that of 1909, suffered a severe set-back from 1910. The reason is the overstocking of the American market, which is easily the largest buyer. Efforts are now being made to advertise the better grades of Philippine cigars in the United States. The Tobacco Association took the matter up, and certain regulations were made as to the size and grades of tobacco to be used for the manufacture of cigars for the United States.

The trade in cigarettes shows a slight decrease all round with the exception of Hong Kong, which Colony took an increased quantity. (*Diplomatic and Consular Reports* No. 4997 Annual Series; September 1912.)

CALCIUM AND MAGNESIUM IN THE SOIL.

The effect of different proportions of lime and magnesium in soils has for some years received considerable attention from the manurial aspect and has been referred to in the *Agricultural News*, Vol. XI, p. 184, among other places. But it was not until 1910 that Lipman and more recently Kelly began investigations upon the influence of these substances on nitrification and ammonification. The following information is obtained from the University of California Publications, Vol. I, No. 3, in which Kelly's work is described.

The addition of calcium carbonate to 100 grams of the particular soil experimented with, stimulated the ammonification of dried blood that had been previously added, and in the case of nitrification, a 50-per cent. stimulation was effected by the addition of 1 gram of the salt to the amount of soil mentioned.

With magnesium carbonate a pronounced toxic effect was produced. In the ammonification of dried blood a loss occurred compared with the experiments without the use of carbonates, while in the nitrification experiments, magnesium carbonate completely prevented nitrate formation. No evidence of antagonism between calcium and magnesium carbonates was observed.

It is pointed out that these remarkable phenomena are not necessarily universal, in fact data appear to have been already obtained from other soils showing that the effects described above are unusual; and before generalizations can be made there must be further investigation. An interesting extension of the work is the examination, in a similar manner by the same investigator, of Hawaiian soils, and when the results have been completed they are likely to prove an important addition to the present scanty knowledge of biological transformations in tropical soils.

COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date December 30, with reference to the sales of West Indian Sea Island cotton :—

Since our last report about 200 bales of West Indian Sea Islands have been sold at steady prices. The sales include Old Crop cotton from the islands of Nevis, St. Kitts, Montserrat, St. Vincent and St. Croix at prices ranging between 15*d.* and 17*d.*, also New Crop Nevis and Montserrat at 17*d.* and New Crop St. Kitts from 18*d.* to 19*d.*

There is very little doing in the lace trade at the moment, and therefore the finer qualities of West Indian Sea Islands are only in limited demand, but we are hoping for an improvement before long. The lower qualities are seriously handicapped by Sakellarides cotton, which has been found to not only compete with Floridas and Georgias successfully, but also against the inferior grades of American and West Indian. This description is selling at 12*d.* to 13*d.*

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending December 21, is as follows:—

The market has been quiet throughout the week, with no demand except for the Extra Fine off in colour at 26c. Factors, however, are continuing to hold rather firmly for their asking prices. The Bureau reporting the amount ginned to December 13 as only 4,762 bales, against 4,802 bales last year, pointing to a crop of not over 7,000 bales, encourages them in doing so.

There has been no further inquiry for the Planters' crop lots

We quote, viz.:—

Extra Fine	29c.	=	16½*d.*	c.i.f., & 5 per cent.			
Fully Fine	27½c.	=	15½*d.*	,,	,,	,,	,,
Fine	26c.	=	14¾*d.*	,,	,,	,,	,,
Extra Fine off in preparation	26c.	=	14¾*d.*	,,	,,	,,	,,
Fully Fine off in preparation	24c.	=	13¾*d.*	,,	,,	,,	,
Fine off in preparation	22c.		12¾*d.*	,,	,,	,,	,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, to December 21, 1912, were *nil*, 196 bales, and 1,202 bales, respectively. Last year, they were 2,831, 8,115 and 4,835 bales.

THE WEST INDIAN COTTON-GROWING SEASON, 1911-12.

The following statistics are added, in order to complete the information given regarding the West Indian cotton-growing season, 1911-12, in the two last numbers of the *Agricultural News*:—

WEST INDIAN COTTON EXPORTS, QUARTER ENDED SEPTEMBER 30, 1912.

Origin.	No. of bales.	Weight, lb.	Estimated value.		
			£	s.	d.
Antigua	423	80,480	5,070	11	4
Barbados	79	37,428	2,339	5	0
Grenada	3	631	28	14	6
Montserrat	1	272	22	13	4
St. Kitts	35	12,195	762	3	9
Nevis	24	6,025	376	11	3
Anguilla	10	2,000	125	0	0
St. Vincent.	14	3,977	314	16	11
Trinidad & Tobago	6	1,294	194	0	0
Virgin Islands		None			
Jamaica	57	20,175	1,538	2	6
Total	652	164,477	10,771	18	7

WEST INDIAN COTTON EXPORTS, OCTOBER 1, 1911, TO SEPTEMBER 30, 1912.

Origin.	No. of bales.	Weight, lb.	Estimated value.		
			£.	s.	d.
Antigua	1,211	244,671	16,106	1	5
Barbados	927	455,689	28,112	5	4
Grenada	1,269	380,264	12,691	3	10
Montserrat	947	344,753	22,975	10	7
St. Kitts	782	332,168	21,251	19	7
Nevis	513	165,329	10,643	12	3
Anguilla	460	97,142	6,269	11	10½
St. Vincent	1,532¾	533,938	40,514	5	4
Trinidad & Tobago	45	12,263	1,017	0	0
Virgin Islands	233	51,677	3,037	5	0
Jamaica	113	38,529	2,871	14	2
Total	8,032¾	2,656,423	165,490	15	4

It is useful to include the following statistics of the crop season 1911-12, in St. Vincent, which have been supplied by the Agricultural Superintendent. In forwarding them, this Officer draws attention to the low average yield per acre, which is attributed chiefly to the very unfavourable weather of September 1911:—

Area planted.	Total yield.	Yield per acre.	Estimated value.
Sea Island:—			
5,068 acres	487,116 lb.	96 lb.	£38,563
Marie Galante:—			
1,037 acres	46,822 lb.	45 lb.	1,951
Cotton seed of all kinds:—			
	700 tons (approx.)		3,500
Total value of cotton products			£44,014

BOLL-SHEDDING IN COTTON.

The following information refers not only to the shedding of the bolls of cotton, but also to the dropping of the leaves, flowers and buds before maturity. It is taken from *The Cotton Plant in Egypt*, by W. L. Balls, M.A., which was reviewed in the *Agricultural News*, Vol. XI, No. 278. The greatest attention is paid to the shedding of bolls, in the West Indies, where it is recognized that this follows sudden changes in the weather conditions surrounding the plant.

The act of shedding is, of course, under the control of the plant, its immediate cause being the formation of a special tissue across the base of the stalk of the leaf, bud or flower. The facultative position of this tissue, or 'absciss-layer', is marked by a slight groove on the stalk. When the determining stimulus has been received by the cells of this layer, which are otherwise indistinguishable from their neighbours, they proceed to divide, and the daughter-cells separate from one another, thus destroying the continuity of the stalk except in such tissues as the wood. The phloem being among the severed tissues, synthesized food-supplies are cut off, the organ dies, sooner or later the stalk breaks, and the organ is shed. Even before any sign of unhealthiness becomes visible, the stalk may break at a light touch, being retained merely by the wood vessels, bast fibres, and cuticle.

The reaction to the determining stimulus is very rapid in cotton, on account of the extreme simplicity of the absciss-layer. A convenient way of provoking this unknown stimulus is to cut off a few roots. Within four days after such treatment, we find that complete severance of the tissues of the absciss layer has taken place. Microscopic examination at intermediate stages shows that the plate of dividing cells is only one cell thick, that the division begins at the periphery, and extends towards the centre, and that the dividing wall between the daughter-cells splits immediately along its middle lamella. The daughter-cells which are left on the face of the scar, after the stalk has broken away, bulge outwards, and form a simple callus.

In many plants this stimulus is also provoked by non-pollination, so that unfertilized flowers are shed. This occurs in cotton, of course, but it does not seem to be common under ordinary conditions.

For the present we are unable to form any clear conception of the chain which extends from the severed root to the absciss-layer. It is certain that the main factor, if not the only one, is the water-content of the plant. Mere severance of the root does not provoke shedding as a traumatic stimulus [stimulus arising from wounding]; thus, plants which are screened from direct sun after the root has been damaged, show little or no shedding. Consequent on such root damage we find a general closure of the stomata, and it seems at least probable that this abnormal closure reacts first of all on the absciss-layer, by bringing about abnormal internal temperatures. Much more experimental work is required before further discussion can be profitable.

Though the primary cause of shedding in Egypt is a deficient root absorption, it follows that an excessive transpiration rate must produce the same result, since the terms 'deficient' and 'excessive' are relative. A very dry hot day may provoke shedding, but such weather is infrequent at the time when shedding is important. The heavy shedding of wide-sown plants as compared with that of plants in field crop is probably caused by excessive transpiration, or rather, by too great irregularity in this function, since wide-sown plants are freely exposed to wind, and do not create a humid 'surface climate'. In the Sudan, however, spells of hot dry wind are generally recognized as being the precursors of shedding epidemics.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados by the R.M.S. 'Trent', on January 13, for an official visit to St. Lucia. Dr. Watts is expected to return by the S.S. 'Korona' on January 25.

Mr. F. W. South, B.A., Mycologist to the Department, left Barbados for Montserrat by the R.M.S. 'Trent' on January 13, in order to make investigations regarding plant diseases in that island.

Sisal Hemp in German East Africa.—H.M. Vice-Consul at Dar-es-Salaam reports that, according to the local press, the cultivation of sisal hemp in German East Africa yields a crop second only to rubber in importance to the Protectorate. The plant was introduced into the country from Central America some fifteen years ago, and the exports of fibre have increased from 204 metric tons in 1901 to 7,228 metric tons valued at £150,569, in 1910. The plants attain full growth in East Africa in about seven years, but the first leaves can be cut after three years' growth. In 1911 there were 19,050 hectares (about 47,039 acres) planted with sisal in German East Africa, of which 7,655 hectares (about 18,901 acres) were productive. The majority of the sisal plantations are in the northern districts in the Tanga hinterland, where about 16,000 hectares (about 39,506 acres) are planted. There are about 2,000 hectares (about 4,938 acres) in the district of Lindi, to the south, and plantations have recently been formed near the railway running from Dar-es-Salaam to Taborah. (*The Board of Trade Journal*, December 5, 1912.)

A curve given in the Semi-annual report of Messrs. Schimmel & Co., dated October 1912, showing the average prices of Ceylon citronella oil from 1892 to 1911-12, in pence per pound c.i.f. London, indicates that these remained just above 10*d.* until 1894, after which year they gradually rose until in 1896 they were just above 14*d.* There was then a gradual drop until 1902, when they were 8¾*d.* A quick rise brought them to 18¼*d.* in 1906, and then there was a gradual fall until the beginning of last year to just under 11*d.* Since that time, there has been a quick increase which brought them to 16½*d.* in August 1912. In this information the term 'average prices' means the average of the monthly prices of each year.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

In this issue the editorial is concerned with the Division of Labour. The subject is considered mainly from the point of view of the practical agriculturist.

Under the heading Departmental Reports, on page 19, a review is given of the Report on the Agricultural Department, St. Lucia, for 1911-12.

One of the matters presented on page 21 is a short article detailing the results of recent work on the effects of calcium and magnesium in the soil.

The Insect Notes will be found on page 26. They consist of the first of two articles presenting a summary of entomological information given under this heading during 1912.

An interesting article on vegetable silks appears on page 29.

On page 30, the Fungus Notes consist of an account of a disease of tanias in Jamaica, based chiefly on work of investigation that has been carried out in that island.

The same page contains the greater part of an article of some interest, dealing with new sources of paper that have received recent attention.

The Action of Sulphur on the Soil.

It has been known for some time that organisms like *Thiospirillum Winogradskii* utilize, as a source of energy, the sulphuretted hydrogen in the soil. They decompose this gas and store up in themselves the granules of sulphur, which are eventually used up in the formation of sulphuric acid. This sulphuric acid combines with some base in the soil, generally lime, forming—in the case of lime—gypsum. There exist also in the soil several common decay bacteria like *Bacillus mycoides* and *Proteus vulgaris* which have the power of decomposing gypsum, and this eventually results in the formation of sulphuretted hydrogen. The chemical reaction as a whole is therefore biological, revertible and exothermic.

In connexion with the above facts the effect of adding sulphates to the soil was tried, and it was found that, though sulphates at first retard humification, they eventually favour nitrification.

A continuation of this work was the favourable effects of the element sulphur when applied to the soil established early in 1912 by several investigators in France and Germany. Sulphur was found to have a fungicidal action; to modify the conditions of life of soil bacteria, and to act eventually as a food for cultivated plants.

More recently Boullanger and Dugarin in France have investigated the action of flowers of sulphur on nitrous or nitric bacteria in the soil. It is stated in the *Bulletin of the Bureau of Agricultural Intelligence* for October last that they have found that sulphur promotes the activity of ammonifying bacteria but that it has no influence on the nitrogen-fixing bacteria (*Azotobacter*, *Clostridium*, etc.). It would appear from this that the favourable effect produced on crops is due to the increased rate of formation of available ammonium salts from unavailable nitrogenous compounds in organic matter.

Sacchulose: A New Foodstuff.

The name Sacchulose has been given to the transformed product resulting from the treatment of sawdust with a weak solution of sulphurous acid under a pressure of about 100 lb. to the square inch (Classen Process). A paper on the subject, by A. Zimmerman, appears in the *Journal of the Royal Society of Arts*, for December 6, 1912. In this a table shows the extent of the conversion that occurs during the Classen Process.

From this table it appears that, after conversion and the expulsion of volatile substances, the percentage of sugar had increased from nothing to 25; whilst the other carbohydrates soluble in acid and alkali had decreased from 31·0 to 18·0 per cent., and the carbohydrates insoluble in acid and alkali from 68·3 to 56·3 per cent.

It will be observed that the 25·0 per cent. of sugar is apparently drawn equally from the soluble and insoluble carbohydrates, though in the discussion which followed the reading of the paper, W. F. Reid doubted the conversion of cellulose into sugar and suggested that it had been derived from other substances contained in the wood. However, C. F. Cross accepted the statement and pointed out that the digestion of ligno-cellulose was a question of degree as had been long established by Kellner, in Germany.

The greater part of the paper deals with feeding experiments carried out with Sacchulose. The first experiment was with draft-horses working during the hot weather. A reduction of 4 lb. of oats in the basal ration was replaced by 4 lb. of Sacchulose. The animals thus fed showed a net gain in body weight compared with the control animals with which they had been working. In another experiment Sacchulose was mixed with molasses and confirmatory results were obtained.

The points dealt with in the paper are fundamental: but from the commercial aspect it is improbable that Sacchulose could ever be placed on the market at a lower cost of production than molasses. At present sawdust is cheap, but its supply is limited, and is in the hands of the saw-mill owners. With any increase in demand there would be a proportional rise in price, possibly sufficient to prohibit entirely the manufacture of Sacchulose on a commercial scale. Moreover, as is pointed out in a recent number of the *West India Committee Circular*, due regard must be had to the practical dietetic value of a food apart from its chemical composition and calorific value. It is not to be expected that an animal would thrive as well, in the long run, on sugar from sawdust as it would on natural molasses extracted from the sugar-cane.

The general position, then, would appear to be somewhat as follows. It is open to question whether Sacchulose could be produced on a large scale in England: if it were, buyers should refrain from giving as high a price per unit of heat value as in the case of natural molasses. For feeding purposes it would probably be economical to mix Sacchulose with molasses with a view of increasing the digestibility of the 56 per cent. of woody fibre which Sacchulose contains.

The Flowers of the Papaw Plant.

This subject has already been referred to in the *Agricultural News*, in Vol. XI, p. 9, where the well-known fact is pointed out that the male and female flowers of the papaw are usually produced on separate trees, and that occasionally flowers possessing both characteristics (hermaphrodite flowers) arise in female inflorescences. It is further stated that a 'male' tree can be caused to bear female flowers, and eventually fruit, by cutting it back. *L'Agriculture Pratique des Pays Chauds* for October 1911, gives attention to an exceptional case where hermaphrodite flowers arose in a male inflorescence on a plant in the Jardin Colonial in Upper Guinea, and an issue of the same journal for October 1912, describes in detail the structure and relationship of these different flowers obtained from a plant grown under artificial conditions in Paris.

It was observed first of all, that in the case of this artificially grown plant the upper inflorescences bore more female flowers than the lower branches, whereas the converse occurs in nature. It is supposed that the intensity of the heat and light between the top of the plant and the glass under which it was grown was the cause of this abnormal development.

The paper under review then proceeds to describe the ordinary male and female flowers, and the hermaphrodite flowers, and points out the differentiating characteristics. Externally, the hermaphrodite flowers resemble the female flowers but are somewhat longer and less globular. The corolla is gamopetalous, and on it are situated the stamens which, unlike those of the male flower, vary in number from one to three. The anthers contain abundant pollen, and the numerous seeds produced by the hermaphrodite flowers were tested and found to possess a high germination capacity. The fruits weigh about 6 oz., and are always longer and less globular than those produced by the female flower.

The main point of botanical interest, however, which results from these observations, is the fact that all the different transitional stages are to be seen between the male and female flower; but for a proper appreciation of this, reference must be made to the excellent drawings which illustrate the text.

Tapping Rubber Trees by Electricity.

A German inventor, resident in Peru, claims to have constructed an electrical appliance which will tap rubber trees and coagulate the latex. The matter is dealt with at some length in the *India Rubber World* for December 1, 1912 The actual method of working of the tapping and collecting device is not very clearly described, but the general arrangement and management of the system is briefly as follows. Hollow iron channels, divided into a series of sections, are placed upon the trunk of the rubber tree. Within these sections are pricking devices which work independently, so that different areas can be tapped at different intervals. Within the sections are receptacles containing on acid preparation where the latex is coagulated into rubber.

It is stated that trees fitted with the apparatus need not be visited until the expiration of sixty days, and on a large tree where there may be nine of these devices—each with thirty cups—there will be 270 lumps of coagulated rubber waiting for the gatherer.

The electric power is generated at a central station and distributed from tree to tree by insulated wires. In putting forward the advantages of the system no mention is made of the cost of erecting and maintaining the central station—a great expense unless water-power happens to be available—but the system should certainly prove economical as regards labour, and provide a convenient method of tapping trees situated in inaccessible places; it should render practicable the tapping of trees at the time of maximum flow of latex, namely, before sunrise; and the small punctures made by the device reduce the time required in ordinary practice for the bark to heal.

On the whole, it appears that the invention has possibilities, particularly in tropical forests where extensive, and not intensive, methods of collection are likely to prevail.

INSECT NOTES.

SUMMARY OF ENTOMOLOGICAL INFORMATION IN THE AGRICULTURAL NEWS IN 1912.

In the *Agricultural News* for January 6, 1912 (see Vol. XI, p. 10) a brief summary was given of the information put forward during the year 1911. In a similar manner it is now proposed to summarize the information relating to entomological subjects given in this journal during 1912.

In the number for January 20, the Insect Notes consisted of a brief review of the insect pests of the preceding year, the information being obtained, in response to a request by the Imperial Commissioner, from the agricultural officers in the several islands. The succeeding information given here will deal with the insect pests of the different chief crops.

SUGAR. The froghopper of the sugar-cane (*Tomaspis varia*) has been a serious pest in Trinidad for several years. Information in regard to this insect was presented in an article entitled Entomology in Trinidad, where the results of certain experiments in burning canes in the fields and the grass-grown traces are given, as well as of those in the use of the froghopper fungus. (*Metarrhizium anisopliae*). The best results in burning were obtained in those fields where the canes were cut and then burned. The froghopper fungus appeared to be doing good work. Mention is also made of the Mexican predaceous bug (*Castolus* sp.) which had been introduced as an enemy of the froghopper. This article appeared on p. 314.

The brown hardback (*Phytalus smithi*, Arrow), or the sugar-cane beetle as it is called in Mauritius, is the subject of the Insect Notes on p. 90, and is briefly mentioned on pp. 234 and 314. In the first of these references, the enormous numbers of this insect captured and destroyed are mentioned and a brief account is given of the method of collection. It is also stated that the insect in Barbados is identical with the Mauritius species. In the note on p. 234 mention is made of the discovery in Barbados of a parasite of the brown hardback. This parasite is a black wasp which was identified as *Tiphia parallela*, Smith. On p. 314, further reference is made to the numbers of the beetle captured in Mauritius. The total catch for the season amounted to over 26 million, while the greatest catch for any one day (or night) was something less than 3 million. The weight of these enormous numbers of insects is of interest: it is said to have amounted to about 20 long tons and about 1,540 lb. respectively.

During the year a new pest of sugar-cane was reported from St. Croix in the Danish West Indies. This is *Strategus titanus*, a brown beetle the larva of which is a large, whitish grub living in the soil and attacking the underground portions of the cane.

The weevil borer (*Sphenophorus obscurus*) as a pest of sugar-cane is mentioned in an article entitled Economic Entomology in Fiji (see p. 218). This appears to be the principal pest of sugar cane in Fiji, where it is controlled by means of baits of small pieces of split cane distributed on the ground to attract egg-laying females. The baits are collected and burned when eggs have been laid in them.

Two articles based on a report on a visit to St. Kitts (pp. 282 and 298) also mention insects which occur as pests of sugar-cane. The chief of these are termites, provisionally identified as *Termes flavipes*, which cause serious injury to canes on a limited area in that island. Another insect, *Lachnosterna patruelis*, occurs in abundance in the soil of cane fields in the locality where the termites are known. A root borer also occurred in these fields. This was the larva of a weevil, and although an adult was not reared from the larva, circumstances seemed to indicate that it might be a well-known greyish brown weevil* which occurs throughout the Leeward Islands, where it feeds on the leaves of citrus plants, and is commonly to be found hiding in pigeon peas, and other bushy plants growing in the vicinity of cane fields.

The sugar-cane insects of Hawaii formed the subject of an article which appeared on p. 74. This was a review of Bulletin 93 of the United States Department of Agriculture, Bureau of Entomology. The leaf hopper (*Perkinsiella saccharicida*) is the principal pest of sugar-cane in Hawaii, the damage done by this insect in 1903 and 1904 having been estimated at about $3,000,000. In more recent years this loss has been greatly reduced, largely by means of natural enemies which have been employed under scientific control.

The occurrence of the cane fly (*Delphax saccharivora*) in Martinique in 1910 is mentioned at p. 234.

COTTON. Perhaps the most important feature in connexion with the pests of cotton during 1912 is the discovery, by the Entomologist of this Department, of the leaf blister mite (*Eriophyes gossypii*) in Barbados. This mite has been known in other West Indian islands since 1903, but until the early part of 1912 it was not known to occur in Barbados. After its discovery, however, investigation revealed that it was widely distributed in the island and that it had probably existed there for more than one year, but had not been observed and reported. References to this occurrence are to be found at pp. 90 and 106.

The cotton worm in the United States in 1911 was the subject of a note (see p. 266) in which the theory was advanced that the unusual outbreaks of this pest in the United States in 1911 resulted from migrations of the adult insect, presumably from Mexico and Central America or the West Indies. The occurrence of the cotton worm in Trinidad is referred to in the article already mentioned (Entomology in Trinidad; p. 314).

Reference is made to experiments with the cotton boll weevil in Cuba (see p. 170), where it is said to have been found that by late planting and the destruction of cotton plants, as soon as the crop is harvested, cotton can be grown satisfactorily even though boll weevil is present. In the United States, however, early planting has produced more satisfactory results than late planting.

The occurrence of a weevil in German East Africa, which attacks Caravonica cotton in a manner similar to that in which the boll weevil attacks Upland cotton in the United States, is mentioned at p. 266.

BANANAS. Insects attacking the banana have been discussed at pp. 170 and 218. Both these references are to the occurrence of the banana weevil (*Sphenophorus sordidus*) in Fiji, which is of interest because, while this insect is a serious pest in that place, it occurs in the West Indies without attracting any very special attention.

COCO-NUTS. Pests of coco-nuts have been referred to in three places during the year. In the article on Economic Entomology in Fiji (see p. 218) mention is made of several coco-nut pests.

A new species of white fly (*Aleyrodicus destructor*) attacking coco-nuts is recorded from the Philippines. Another article referring to coco-nuts in the Philippines, entitled Protection of Coco-nut Palms from Beetles, appeared at p. 378. It gives an account of legislation having for its object the control of coco-nut beetles, *Oryctes rhinoceros* and *Rhynchophorus ferrugineus*, by compelling owners to destroy trees which are dead or dying as a result of attacks of these beetles.

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* Since identified as *Exophthalmus esuriens*.

CORN. The corn ear worm (*Laphygma frugiperda*) occurred in unusual numbers in the Southern United States during 1912, and in Trinidad also it was more than ordinarily abundant. An account of these occurrences was given on p. 346.

MANGOES. Several species of fruit flies attacking mangoes were mentioned in an article entitled Mango Pests in the Philippines (see p. 106); other insects capable of causing serious injury to mangoes mentioned in the same article are the so-called mango flies—two species of the genus Idiocerus. These are Hemipterous insects which with their sucking mouth parts damage the buds and tender twigs.

CACAO. The method of trapping the cacao beetle (*Steirastoma depressum*) which had been found successful in Trinidad was described on p. 314.

This account will be continued

CHANGES IN CALCIUM CYANAMIDE.

A paper dealing with the changes in calcium cyanamide in a temperate climate is thus abstracted in the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for October 1912:—

Calcium cyanamide, especially if it is in a more or less moist medium, absorbs a certain amount of water and carbonic acid which go to increase the weight, and result consequently in a reduction of standard; it is doubtful, however, whether in correspondence herewith a real and genuine loss of nitrogen must be assumed to take place.

Taking up this question, the writer has carried out a series of researches on three specimens of calcium cyanamide kept for periods of twenty-five and fifty days, both in a dry and a moist medium. The losses of nitrogen were estimated directly, by collecting and ascertaining the quantity of ammonia given off during the experiment; indirectly, by making a determination of the nitrogen before and after the experiment, with an innovation in the method inasmuch as the determinations made after the experiment were carried out on quantities of material weighed before the experiment, and afterwards submitted in their entirety to analysis, so as thus to obtain the real and actual loss of nitrogen, independently of any variation of weight undergone by the fertilizer. In both cases the specimens were kept in bell jars through which a slow current of air driven by a fan passed.

The results obtained show that calcium cyanamide does effectively undergo a loss of nitrogen, which, however, even in a moist medium is very small. In this experiment the material was spread out and broken up, so that it had a large surface exposed to the action of the moisture which causes the loss of nitrogen, while under real practical conditions this does not take place, nor is the material kept in media saturated with moisture; for this reason, the writer is of opinion that in practice the losses to be apprehended will be almost *nil* or very small, especially if the medium is not very moist.

In a second series of enquiries carried out on the same materials and under the same conditions, the writer concerned himself with the variations undergone by nitrogen in the cyanamide form. From the results he notes that nitrogen in this form undergoes constant diminution in the course of time; this diminution, though small in a dry medium, increases considerably in the open air, and may result in the almost entire disappearance of the cyanamide form in a moist medium. He therefore thinks that in calcium cyanamide the progressive conversion of the nitrogen in the cyanamide form into other forms, which remain in the manure, is produced by the action of moisture.

Finally, in a third series of investigations, the writer studies the course of this transformation in the aqueous solution of calcium cyanamide, likewise extending his attention to the dicyandiamide form. He works with concentrations of 1 per cent. and 5 per cent. at a constant temperature of 27° C. The percentage of cyanamide and dicyandiamide nitrogen, determined at various intervals of time, are summed up in a table and represented graphically in two diagrams which show:—

(1) That the cyanamide form diminishes continuously until complete disappearance, with greater speed in the more concentrated solution.

(2) That the dicyandiamide, which is *nil* or almost *nil* at the start grows rapidly to a maximum, after which it diminishes continuously, and the phenomenon is more pronounced in the more concentrated solution, in which the formation of dicyandiamide is greater.

A notable fact in these solutions is the formation of crystals of calcium hydrate, while the formation of ammoniacal compounds does not take place; a mixture of two or three different crystalline forms of deliquescent nitrogenous compounds, melting below 100° C., which was isolated from the solution, appears to contain the final forms into which the nitrogen of the calcium cyanamide passes. It must be held, therefore, that the conversion of the cyanamide in the soil must not be attributed exclusively to physico-chemical causes determined by the presence of zeolites* and colloids† in general, but must in great part be due to the action of the calcium present in the substance.

A Work on Tropical Products.—There has been published lately, in German, an aid in botany for planters, colonial officers, business men in the tropics and travelling investigators (*Botanisches Hilfsbuch für Pflanzer, Kolonialbeamte, Tropenkaufleute and Forschungsreisende*), by Dr. Hubert Winkler. This is reviewed in *Der Tropenpflanzer* for December 1912, which commences by emphasizing that the want has long been felt for a book in which the unprofessional man may find, in a closely abbreviated form and alphabetical order, the most important facts concerning useful tropical plants. The book is stated to be to a certain extent a counterpart of Ferdinand von Müller's *Select Extratropical Plants*, which is no longer published in English, but has been translated nevertheless into German; it is now so out of date that it requires to be rewritten. The work mentioned actually dealt only with extra-tropical plants. Winkler's book is really concerned with tropical crops which possess importance from the standpoint both of Germany and her colonies. The greater part of the book contains descriptions of the crops and information concerning their culture, uses, and so on; and there is given a detailed table, in the order of the botanical names of the plants, carefully arranged, together with the common names; another table classifies the matter under the names of the products. The book is stated to be cheap, and it is expected that it will have a wide sale, particularly as a supplement to the statistics concerning raw materials that are found in the libraries of large commercial firms—those engaged in trade as well as those concerned with planting. The work is published by the Hinstorffsche Verlagsbuchhandlung, Wismar.

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*Minerals soluble in acids, in which most of them deposit silica.

†Substances which pass only exceedingly slowly through a porous membrane.

GLEANINGS.

The distribution of plants from the Antigua Botanic Station during December 1912 comprised: cane cuttings 12,900, limes 3,024, onion sets 2,500, coco-nuts 250, and miscellaneous plants 134.

It is announced in the *Diario Official*, Brazil, that an experiment station for cotton-growing is to be established in one of the districts of the state of Maranhão, for the purpose of encouraging intensive cotton-growing.

There was a large deficiency in the rainfall of Dominica during last year, as is shown by the fact that the total precipitation received at the Botanic Station was 63·75 inches as compared with 97·26 inches in 1911.

For the year ending September 30, the total sugar consumption of Europe was 4,659,000 tons. For the year 1910-11 it was 5,242,000 tons. Great Britain still leads the nations and consumed 1,888,000 tons during the past year. (From the *Louisiana Planter*, December 21, 1912.)

With regard to the introduction and extension of crops in St. Vincent, it may be mentioned that during last month 7,000 coco-nuts were imported from St. Lucia and fumigated for planting purposes, and that 1,000 seeds of *Havea brasiliensis* were received as well by the Agricultural Department, from Singapore.

Colonial Reports—Annual, No. 738, shows that the exports from Northern Nigeria by way of the River Niger during 1911, were valued at £594,083, against £308,700 during 1910. Among the principal articles causing the increase was rubber, the value of which rose from £37,900 in 1910 to £53,511 in 1911.

A Bulletin received from the Director-General of the Department of Agriculture, Egypt, shows that the cotton crop in both Lower and Upper Egypt was expected, on December 1, 1912, to be above the average. In Lower Egypt the first picking has been especially heavy, but subsequent pickings did not yield as much as had been anticipated.

A report of the Goat Show held at Queen's Park by the Barbados Goat Society on December 18, which has been received from the Secretary, shows that the prize of $10 and a diploma of merit offered by the Commissioner of Agriculture were won by Mr. L. A. Stoute's goat, Handsome. This animal is one-half Toggenburg and three-eighths Anglo-Nubian.

In a monograph prepared by the Director-General of Commercial Intelligence, India, and entitled Burma Rice, it is shown that, out of an export from British India of 2,256,068 tons of rice, 1,719,576 tons came from Burma; this proportion is over three-quarters of the whole. It appears in addition that Burma supplied 63·4 per cent. of the rice consumed by the Western World.

At a meeting of the Nevis Agricultural and Commercial Society, held on December 24, it was decided to hold an agricultural show on the 30th instant. It may be mentioned, as of some interest, that a supply of Paris green and lime has been stocked by the Government in the island, as a result of recent experience in the want of the insecticide to control the cotton worm.

The Commissioner of Agriculture has been informed by the Acting Colonial Secretary, Antigua, that the certificates gained by the successful candidates in the recent examinations held in connexion with the Reading Courses of this Department will be presented to them by His Excellency the Governor of the Leeward Islands, at the Agricultural Show to be held in Antigua on February 20.

It is stated by the Agricultural Superintendent in St. Kitts that the cane crop, in the northern district where the rainfall has been maintained, has made useful progress and that the prospects for the coming season are very good. In the Basseterre district, the canes have greatly recovered from the drought, but are still very backward for the time of the year, and require heavy rains for their proper growth.

The Tenth International Congress of Agriculture will be held at Ghent from June 8 to 13, 1913, at the same time as the International Exhibition. The subscription for membership is 16*s*. Further information may be obtained from M. Vandervaeren, Assistant General Secretary, 228 Chaussée d'Alsemberg, Brussels. The Congress will be divided into five sections, dealing with rural economy, the science of agriculture, animal industry, rural engineering, and forestry.

The typhoons have done tremendous damage to the Formosa sugar crop, and at one time it was calculated that the decrease would be no less than 40 per cent. Later reports are, however, not so bad, and it is now anticipated that only a 30 per cent. reduction will be experienced and that the total crop will amount to 1,700,000 piculs (101,200 tons). Last year's production of the thirty-three sugar factories at work was 179,000 tons. (The *International Sugar Journal*, December 1912.)

An account is given in *Teysmannia*, 1912, No. 2, p. 92, of a trial of daily and alternate daily tapping of Hevea. The number of trees in the experiment was 600, divided into two lots of 300. In the first quarter of March 15 to December 14, one lot was tapped daily and the other lot every other day. In a similar second period the treatment was reversed, and that of the first period resumed in the third; while there was a fourth similar period in which the treatment of the second was repeated. The table of results shows that daily tapping gives a much higher yield of rubber than tapping trees every other day.

STUDENTS' CORNER.

In continuation of the notes on economic matters relating to estate management, which last appeared in the *Agricultural News*, Vol. XI, p. 349, the student's attention is now directed to the subject of the grading, packing and transport of agricultural produce.

In central sugar factories, owing to co-operative and labour-saving methods, and chemical control, the grading, packing and transport of produce attains a high standard of efficiency. But the student will not fail to note that in supplying the central factory—which can be regarded as a local market—the same principles apply in sending to the mills healthy, well-packed and uniform sugar-cane. In this connexion, also, the variety of cane is of importance.

In the case of cotton, the grading is entirely in the hands of the grower, the packing and shipping are done by the central ginneries, or the exporting may be done through individual agents. (See *Agricultural News*, Vol. IV, p. 273; and the *A B C of Cotton Cultivation*, Pamphlet Series, No. 45.)

But, as the student will realize, it is in connexion with the more perishable agricultural produce—fruit—that grading, packing and transport demand the greatest consideration. The public taste in large communities has become cultivated and critical: the demand, say, for a pound of oranges, to-day, means the demand for a pound of oranges of a definite variety, uniform in size and condition. The force of this demand affects the retail tradesman, the wholesale buyer and, finally, the cultivator. The grading, packing and transport of fruit is dealt with very fully in the following articles: Packing and Transport of Fruit, *West Indian Bulletin*, Vol. I, p. 296; Cold Storage of Fruit, *West Indian Bulletin*, Vol. V, p. 117; Regulation of Quality of Exported Fruit, *West Indian Bulletin*, Vol. VIII, p. 131; Jamaica Fruit Trade, *West Indian Bulletin*, Vol. II, p. 263; Packing of Exhibits, *Agricultural News*, Vol. IX, p. 130. Reference is also made to the 'Fruit and Fruit Trees' columns in the *Agricultural News*.

Consideration of the perishable nature of agricultural produce suggests the question of insurance. Apart from the insurance of shipments, there is the insurance of cultivations —particularly sugar-cane—and of buildings and live stock. Mutual insurance of live stock is worthy of consideration, particularly as regards those islands where land settlement schemes have largely increased the number of peasant proprietors. The following articles should be referred to in connexion with agricultural insurance: *Agricultural News*, Vol. V, p. 390; VII, p. 185; IX, p. 1. Also the publications of insurance companies should be consulted.

It should be stated that of the following questions the intermediate and final are based upon notes given in the *Agricultural News*, Vol. XI, p. 349.

Questions for Candidates.

Preliminary Questions.

(1) How would you show that plants (a) take in, (b) give off, water?

(2) Mention as many uses of roots as you can.

Intermediate Questions.

(1) Where a two-horse team draws 3,000 lb, a three-horse team draws 5,000 lb. Discuss the reasons for this ratio of 2 : 3 : : 3,000 : 5,000; and make diagrams to show how you would attach the animals to the vehicles in each case.

(2) State how you would measure the area of a field.

Final Questions.

(1) What do you understand by agricultural law? Give a short account of the plant disease legislation in your own island.

(2) Make a cross section diagram, approximately to scale, of any well constructed cattle shed you have seen. Name the different parts and give measurements. What would be the approximate cost of such a building, constructed to accommodate twenty animals? What sanitary arrangements would you enforce in the construction and management of such a building?

VEGETABLE SILKS.

The nature and production of one of the vegetable silks, namely silk cotton or kapok, has already been described in the *Agricultural News*, on page 324 of this volume and in other places. The present article is based upon useful information concerning vegetable silks in general which appears in the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases*, for September 1912.

It appears that attention has been recently directed toward the utilization of various fibres other than kapok and akon, the outcome of a discovery that the preliminary chemical treatment, necessary before weaving, can be applied to the new fibres in question.

The fibre of *Chlorocodon Whyteii* (see *Agricultural News*, Vols. X, p. 285; XI, p. 280) is considered first, and it is stated that it was tested at the spinning factory of Chemnitz and found to be of good quality. The above-mentioned plant is a liane which grows in the neighbourhood of Amani, though not in sufficient quantities to make its exploitation in a wild state a profitable undertaking. Whether its cultivation will pay or not will be proved when the experiments begun at Amani are brought to a conclusion.

The fibres which cover the seeds of *Funtumia elastica* were thought well of, as also were the brown fibres of *Bombax rhodognaphalon*, a tree which is fairly abundant in the forests of German East Africa.

With regard to the production of akon two species, *Calotropis procera* and *C. gigantea* are of interest. The latter species is distributed from India to South China and the Malay Archipelago, while the former has also been found on the steppes of East Africa, especially in the German Colonies. The two species differ very little from one another but *C. gigantea* yields a rather better grade of fibre than *C. procera*. Hitherto akon has come almost entirely from India, but there appears to be no reason why the industry should not be gradually established in other parts of the Tropics. (See *Agricultural News*, Vol. XI, p. 364.)

The fibres so far considered are obtained from plants growing in the wild state. It will be remembered that the characteristic feature of kapok production is the fact that the trees are frequently cultivated. Kapok is, of course, a commercial term, and the vegetable silks included under this term are derived from *Eriodendron anfractuosum* (the silk-cotton tree of the West Indies) and *Bombax* sp. The seeds of *Eriodendron anfractuosum* weigh nearly twice as much as the fibre and contain 23 per cent. of oil, about 20 per cent. of which can be extracted with good machinery. This oil, which is used principally in the manufacture of tallow, has fetched of late years from £14 to £24 per ton. The cake can be used as manure, but it contains only 4 per cent. of nitrogen. The wood of this tree is also of commercial value; it is exported to Germany where it is much used for veneer work.

FUNGUS NOTES.

A DISEASE OF TANIAS.

Information is given in the *Journal of the Jamaica Agricultural Society*, for November 1912, in regard to a disease of the Tania, or Cocoe, as it is called in Jamaica, which appears to be widely distributed in that island. It seems that some varieties of tania, for instance 'Sinkit', 'White Jack' and 'Bamboo', are particulary susceptible: whereas the tania known as 'Sally' is very rarely attacked, even when planted in infected soil.

The disease has been investigated by Ashby, recently Bacteriologist and now Microbiologist to the Jamaica Department of Agriculture. His account of the disease is as follows:—

'The disease is the dry rot caused by a fungus not described by mycologists elsewhere. I have only found it on samples of the Commander variety of cocoe from several places in Portland and St. Mary. The name I have given to it is *Hormiscium colocasiae*. The fungus enters the water-conducting system and stops it up, in part causing an effect resembling drought; in time the water-conveying strands turn brown and give the characteristic appearance to the cocoe when it is split open. The tissue shrinks and splits internally, and when the split extends to the surface, insects, worms and other fungi gain entrance and increase the rot.

'The parasite can only gain entrance through a wound in root or tuber, if not already present in the "seed" or "eye" (an analogy from the "Irish" potato).

'The disease gains entrance then:—

(1) From the seed used for planting in which it is present invisibly to the naked eye.

(2) By infection of the fresh cut surface of the "seed".

(3) Through any wound of root or tuber, however small.

'No. (1) is a very general source of infection. The fungus extends in the water-conducting strands much beyond the parts which become brown: if a diseased cocoe is used for planting, no matter how carefully the visibly diseased parts may be cut away, the fungus may still be present in the apparently sound portion and from this, extend into the buds which grow into the new plant. It is also evident that a cutlass or any knife which has been used in cutting up diseased cocoes will infect the surface of an otherwise sound "seed" and also propagate disease

'I believe that this disease has spread over large areas, and is still extending, as the result of the use of diseased "seed".

'With regard to (3), land which has raised a succession of more or less diseased crops of "Commander" will be saturated with the disease which is preserved in every fragment of decaying root and tuber left in the soil; a wound on root or tuber caused by insects, grubs, or worms, however small, would then make the chance of infection strong. In dealing with the disease two principles must be observed therefore:—

(1) Never plant from diseased material, no matter how slight the visible attack.

(2) Cease to grow the variety in question on land infected by disease; this must hold until experiment has shown how long the fungus retains its vitality in the soil.'

It might be added that Massee ascribed the cause of Colocasia disease of Tanias to *Peronospora trichotoma* (Mass.). In the early stages of this disease a tuber when cut across shows a number of yellow dots or points which correspond in position to the vascular bundles; these become darker in colour as the disease progresses and finally the entire substance of the tuber, with the exception of a thin peripheral portion, becomes blackish in colour and decayed. Although these symptoms possess points in common with those described by Ashby, it is quite possible that two diseases exist and that each is caused by a different fungus.

NEW SOURCES OF PAPER.

Of all raw material, a new fibre is perhaps the most difficult to introduce to the market; it has to be as good and as cheap as (often better and cheaper than) one of the old fibres, and it must be produced on a sufficiently large scale to make its supply uniform. In the case of a fibre possessing exceptional qualities the difficulties attending its commercial introduction are reduced, and this applies to some new sources of paper which have recently received attention in the *Kew Bulletin*, No. 9, 1912.

Early last year, Messrs. Clayton Beadle and Stephens drew the attention of Kew to the value of *Hedychium coronarium* as a source of material for paper-making. This plant, a member of the Natural Order Zingiberaceae, to which ginger belongs, is a native of India; but is also recorded from Central America, the West Indies, New Zealand, Mauritius and West Africa. It flourishes only under tropical swamp conditions, and large areas covered with this plant are to be found in Brazil. The plant is characterized by the horizontal tuberous rootstock which bears erect elongated leaf stems 3 to 5 feet high by ¾ to 1½ inches thick. The aërial portions of the plant are not unlike those of the maize in general appearance. After cutting down the stems it is found that four to five months must elapse before a fresh growth of stems is made. The specific characters of the plant are: Inflorescence ellipsoid or ovoid; 3—5-flowered bracts which are densely imbricate (overlapping) in 5—8-spirals. Staminodia (barren stamens) oblong-lanceolate, white. Labellum (strongly developed petal) widely obcordate (inverted heart-shaped) white, with yellow sometimes near the base. Filament white.

Having satisfied themselves as to the good qualities of Hedychium fibre from dried material received from Brazil, Messrs. Clayton Beadle and Stephens made further investigations with fresh green material obtained from growing plants at Kew. In a letter to Kew, Messrs. Clayton Beadle and Stephens wrote: 'Papers produced from this fibre have even greater tensile strength than the strongest manila papers produced. The strongest manila papers have a strength of 6,000 to 7,000 metres "breaking length". This paper has from 9,000 to 10,000. Its elasticity and folding qualities are exceptional. Moreover, it can be made to bear ink and possess parchment qualities without any sizing or other special treatment.

'The reason for this we find to be due to the presence of the cells associated with the fibre, which are of a semi-gelatinous nature, when chemically treated, and dry into the interstices of the paper and produce natural parchment.'

The following is an extract taken from a paper recently presented to the Eighth International Congress of Applied Chemistry by Messrs. Clayton Beadle and Stephens. 'We draw attention to this fibre as we believe it may become of great industrial importance to the paper trade. Where circumstances are congenial to its growth the plant spreads to the exclusion of all other vegetable growth by means of its rhizomes so that it can be harvested at least once a year, producing a heavy crop. It is an easy pulp to manipulate. It is capable of producing a paper of exceptional strength and can be worked either bleached or unbleached. The fact that the paper in its natural state, without the addition of any materials whatever, can be made to possess grease-proof and self-sizing qualities is a point of commercial importance.'

These investigators have also dressed some of the fibre from the green stem, and the tensile strength tests indicate that it is almost exactly similar in strength to the best pure manila hemp which is the only fibre than can be used in the self-binding reaper machine. It might be added that manila hemp is practically a monopoly of the Philippine Islands from which the export was 121,637 tons in 1904 valued at £4,188,835; but this has declined to 146,208 tons valued at £3,025,036 in 1911.

In view of the valuable nature of Hedychium two other members of the same Natural Order, *Amomum hemisphericum* and *Alpinia nutans*, were submitted to Messrs. Clayton Beadle and Stephens for examination. It would appear from this report that these two species, particularly *Amomum hemisphericum*, could be made to produce a strong brown paper with a long tear, and although less valuable than Hedychium these species might prove very useful sources of material for paper-making.

Amomum hemisphericum is a native of Java. *Alpinia nutans* is recorded from Hong Kong, Formosa, Cochin China, the Eastern Himalayas, and the Malay Peninsula. It is also known from the West Indies, Guatemala, Venezuela, Surinam and Brazil, but like Hedychium it has probably been introduced into the Western Hemisphere from the East.

EXPORTS FROM ST. VINCENT, 1911.

The following information is taken from the Report of the Supervisor of Customs, St. Vincent, for 1911, which was gazetted on November 28, 1912:—

The value of the exports to the United Kingdom amounted to £73,378 as against £63,981 for 1910, showing an increase of £9,397.

The value of exports to British Possessions were £42,166 as compared with £35,306 for the previous year—an increase of £6,860.

Exports to foreign countries amounted in value to £3,081, as against £1,893 for the year 1910—an increase of £1,188.

The following table shows the values of exports according to the classification recently adopted:—

Class I. Food, drink and tobacco	£60,102
Class II. Raw materials and articles mainly manufactured	46,764
Class III. Articles wholly or mainly unmanufactured	1,582
Class IV. Miscellaneous and unclassified	1,046
Class V. Bullion specie	9,131
Total	118,625

Under Class I, the principal article is, of course, arrowroot, the value of which amounts to £40,429; cacao is valued at £5,069, live stock at £4,671, ground nuts at £1,060, sugar and syrup at £5,743, and vegetables at £1,455. All the above are the produce or manufacture of the Colony.

Under Class II, the principal item of export is cotton valued at £41,619. Cotton seed is valued at £3,851.

Under Class III, the only item of any importance is cassava starch valued at £1,268.

Class IV does not call for any special comment.

Class V is composed of:—

Bank notes	£3,932
Silver	5,198

The following exports have increased in value to an appreciable extent:—

Article.	Increase.
Arrowroot	£10,339
Cacao	937
Sugar and syrup	1,936
Cotton	3,210
Cassava starch	488
Specie (including bank notes)	2,601

In the case of arrowroot it is significant that while the exports have decreased in quantity to the extent of 1,038,595 ℔. the value is £10,339 in excess of that for 1910. This is due, as regards quantity, to the fact that exporters have held back much of the year's crop for reasons of their own, and as regards value to the good prices which have been ruling throughout the year 1911.

The value of the following articles of export show decrease:—

Article.	Decrease.
Molasses	£1,482
Ground nuts	683
Vegetables	289

In the case of each of the above articles I believe the reason for the decrease to be the same, namely the appropriation of larger proportions of arable land for growing of cotton and arrowroot on account of the higher prices prevailing for these articles.

In this connexion it will also be noticed that the local consumption of wheaten flour has increased largely as is evidenced by the considerable increase in importation of this article during the year, flour taking the place of vegetables where the supply failed to meet local demands.

In conclusion I would draw attention to the fact that the values of exports of the Colony exceed the value of its imports to a marked extent, which under the circumstances existing in St. Vincent may be taken as an indication of improved economic conditions and an unmistakable sign that the Colony is journeying towards prosperity.

An abstract of a paper in the *Experiment Station Record* for July 1912 gives the results of experiments dealing with the time of the leaf-fall of some tropical trees; they were conducted at the Peradenyia Botanic Garden and Experiment Station, Ceylon, and elsewhere. It was shown that if the trees are pruned in the last month of the year, new leaf-growth is formed in December, which does not fall in the normal period for the loss of the leaves. This led to the conclusion that the normal leaf-fall of the trees observed is not due primarily to external conditions, but that its cause lies in part at least within the plant. It may be stated that the matter is summed up, in Schimper's *Plant Geography*, p. 245, in the following words: 'Such cases of the loss and restoration of the leaves independently of the season of the year can only be due to internal causes. Frequently such a leaf-fall is a sign that the tree is preparing to blossom.'

MARKET REPORTS.

London.—The West India Committee Circular, December 31, 1912; Messrs. E. A. de Pass & Co., December 20, 1912.

Arrowroot—3¾d. to 5d.
Balata—Sheet, 3/6½; block, 2/6½ per lb.
Beeswax—£7 10s. to £7 12s. 6d.
Cacao—Trinidad, 71/- to 79/- per cwt.; Grenada, 65/-; Jamaica, 56/6 to 65/-.
Coffee—Jamaica, 71/6 to 83/-.
Copra—West Indian, £27 15s. per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 15d. to 19d.
Fruit—No quotations.
Fustic—No quotations.
Ginger—48s. to 65s.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 8d. to 1/2; concentrated, £18 5s. to £18 10s.; otto of limes (hand-pressed), no quotation.
Logwood—No quotations.
Mace—1/9 to 2/9..
Nutmegs—4¾d. to 5¾d.
Pimento—2½d. to $2\frac{7}{16}$d.
Rubber—Para, fine hard, 4/7-; fine soft, 4/3½; Castilloa, 4/ per lb.
Rum—Jamaica, 2/1 to 6/-
Sugar—Crystals, 17/9 to 20/-; Muscovado, 11/6 to 14/6; Syrup, 10/9; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., December 13, 1912.

Cacao—Caracas, 15c. to 15½c.; Grenada, 14c. to 15c; Trinidad, 15c. to 15¼c. per lb.; Jamaica, 11¾c. to 12½c.
Coco-nuts—Jamaica, select, $33·00 to $34·00; culls, $19·00 to $20·00; Trinidad, select, $33·00 to $34·00; culls, $19·00 to $20·00 per M.
Coffee—Jamaica, 15¼c. to 16¾c. per lb.
Ginger—8¾c. to 12c. per lb.
Goat Skins—Jamaica, 58c.; Antigua and Barbados, 46c. to 48c.; St. Thomas and St. Kitts, 43c. to 46c. per lb.
Grape Fruit—Jamaica, $1·50 to $2·00.
Limes—$5·00 to $5·75.
Mace—50c. to 52c. per lb.
Nutmegs—110's, 14c.
Oranges—Jamaica, $1·25 to $1·75.
Pimento—4¼c. per lb.
Sugar—Centrifugals, 96°, 4·05c. per lb.; Muscovados, 89°, 3·05c.; Molasses, 89°, 3·30c. per lb., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., January 6, 1913.

Cacao—Venezuelan, $14·75 per fanega; Trinidad, $13·75 to $14·50.
Coco-nut Oil—90c. per Imperial gallon.
Coffee—Venezuelan, 15c. per lb.
Copra—$4·25 per 100 lb.
Dhal—$3·75 to $4·00.
Onions—$1·50 to $4·00 per 100 lb.
Peas, Split—$5·75 to $6·00 per bag.
Potatoes—English, $1·20 to $1·25 per 100 lb.
Rice—Yellow, $5·00 to $5·25; White, $6·50 to $7·00 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., January 11, 1913; Messrs. T. S. Garraway & Co., January 13, 1913; Messrs. Leacock & Co., January 6, 1913.

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Rice—Ballam, $5·10 to $5·60 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $4·75 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, January 4, 1913; Messrs. Sandbach, Parker & Co., January 3, 1913

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
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Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	72c. per lb.	68c. per lb.
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Water and Life

I.

WATER is found in all living tissues, and this circumstance, together with the results of experience, leads to the conclusion (which few would dispute) that water is necessary to life. Organized experience, or experiment and observation, teaches also that water is the substance found most abundantly in living cells. As water is so necessary and so abundant where life is found, enquiry may well be made as to its sources; as to the uses that it fulfils in those ultimate divisions, called cells, of the tissues of plants and animals; and to the way in which it is applied to the purposes that cause it to be indispensable to life.

An exhaustive answer to this enquiry has been made recently in a publication* presenting results that will be largely drawn upon, in this and a following article dealing with the subject. In the order indicated already, the sources of the water required by living beings will be considered first. The most obvious of these are the external supplies, which are drunk by animals and consumed in their food, and taken from the soil by the roots of plants. The rest of the water needed by living organisms is produced in those beings by changes, called metabolic changes, brought about by respiration. This important result of respiration, alone, makes it useful to know in what the process consists and how it takes place.

The most familiar kind of respiration is that entailed in the breathing of animals, resulting as is well known in the consumption of free oxygen and the production of carbon dioxide and water. A simple study of the life-processes in plants shows that a similar action takes place in the leaves; though the production of water in this way for the use of plants often escapes notice. This is called direct respiration. There is also another kind of respiration, called intramolecular respiration, because it takes place between the smallest particles of matter, or molecules, in the cells, in plants as well in animals. In this kind of respiration, the oxygen used is not free, like that in the air, but united to other elements in the food bodies (nutrients), or the tissues; intramolecular respiration causes these to be broken up, and simpler substances are formed which are poisonous and have to be removed as fast as they are produced, or they will kill the protoplasm in the cells, and may cause the death of the whole organism. If these substances are removed continually and proper nutrients supplied, the cells will continue to live, even with little direct respiration; but there will be no formation of new tissue (growth). Direct respiration is necessary for growth.

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* *Wisconsin Research Bulletin*, No. 22.

In respiration by either means, the first result is to take away, by oxidation and by the removal of the elements of water (dehydration), a part of the nutrients in the cell sap and to replace them by water. The strength, or concentration, of the cell sap is thus reduced below that of the surrounding fluids, so that fresh supplies of nutrients move in (by osmosis) through the cell wall. The general effect is that respiring cells are continually receiving fresh nutrient material, while water formed by the changes due to respiration (metabolic water) is constantly moving away. The weakening of the cell sap by metabolic water is the actual means which determines the provision of the cells with food materials.

The sources of water for the living being are, then, direct provision and the changes involved in respiration. It has now to be considered in what ways the water is used: that is, what are the functions of the water. One of the most obvious of these is the dissolving of nutrients, and a second correlated with this is the distribution of the nutrients throughout the organism. In animals, water dissolves the digested food and travels in the blood stream; in plants it forms solutions that comprise the cell sap, and moves from cell to cell (by osmosis) and in special tubes in the wood and bast. Another use of water is the removal of poisonous waste products from the cells in which they are formed; it has been indicated already. Water also controls the temperature to a certain extent, by evaporation: this has been shown to be especially important in the case of plants in tropical sunlight, where the evaporation from transpiration takes place at a very rapid rate. A last use of water in living organisms is confined to green plants, where it forms a source of material that is used in building up organic substances in sunlight—an operation that is called photosynthesis. These are the general and more direct functions of water. Attention will now be given to some of its uses that are less direct and obvious.

Insoluble food bodies that are taken in by animals, or produced in the cells of plants, must be changed into forms that are soluble before they can be used in nutrition. This change consists in the employment of water to form new compounds that are soluble; the process is called hydrolysis, and is described more accurately by saying that the elements of water are added to the molecular structure of the insoluble substances so that entirely new compounds which are soluble are formed. A familiar example is the conversion of starch into sugar: by hydrolysis, water is used in such a way, under the proper conditions, that an insoluble body is caused to form a totally different, soluble body, that can be used directly in nutrition. Changes of this nature are brought about by unorganized ferments called enzymes; they are entirely chemical in nature, and contact with living tissues is not necessary for them to take place. A useful example is the malting of barley, where the germ is actually killed by heat before the enzymes are allowed to act on the starch in the grain and turn it into the sugar which will be eventually converted into alcohol by yeast.

The employment of nutrients in the proper condition, that is after their digestion, results in growth, or repair which is only a special form of growth. Water is again necessary for this to take place. In this case, however, the elements of water are removed from the old compounds and new ones are formed; it is freed, not used up as in hydrolysis. This dehydration, as it is called, requires energy, and the energy is set free through respiration. Carbon dioxide and water have been mentioned already as products of respiration. Another product is heat, and it is in this form that the energy is supplied for dehydration, and therefore for growth. Either direct or intramolecular respiration is effective, and unlike hydrolysis for nutrition, dehydration for growth almost always requires the presence of living protoplasm.

What has been said forms a general summary of the part played by water in the life-processes of animals and green plants. Opportunity will be taken in the next issue of the *Agricultural News*, to consider in a similar way the application of this information to several interesting examples in the plant and animal kingdoms that are of importance to the agriculturist, as well as to all others who are interested in the problems of life and growth.

SUGAR-CANE EXPERIMENTS IN ANTIGUA, 1911-12.

At a meeting of the Antigua Agricultural and Commercial Society held on December 13, 1912, an address of which the following is an abstract was delivered by Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture, on the results of the experiments with seedling canes conducted by the Department of Agriculture in Antigua during the season 1911-12. The abstract has been supplied by Mr. Tempany.

The speaker, in opening, said that experiments had now been repeated thirteen times under the same conditions of cultivation. Experimental canes, forty-two varieties as plant canes and forty-five as ratoons, had been grown at nine stations; they were planted in rows across the fields, each row being a separate variety, and had received the identical treatment afforded to the canes grown for the crop, so that the experimental results were directly comparable with crop results. During 1911-12 the rainfall had been distinctly unfavourable, and low yields were given both by plant and ratoon canes. Besides this, root disease had again been prevalent and was responsible for further decrease in yields

The main collection of canes was grown at Cassada Garden, where also were grown twenty-seven Antigua seedlings and eleven newly-introduced Barbados and Demerara which were grown separately.

In 1911-12 three Barbados and two Antigua seedlings had been introduced into the general experimental series, whilst a number of Demerara seedlings had been abandoned, which had been shown by repeated trials to be unsuited to conditions obtaining in Antigua.

In the table below are given the mean results of the best yields returned by plant canes, in 1910-11, and during the past five years, and it will be seen that low yields were again recorded, as a result of unfavourable conditions.

Means for 1911-12.		Means for past 5 years.	
Name of cane.	Sucrose, lb. per acre.	Name of cane.	Sucrose, lb. per acre.
B.3922	6,020	B.4596	6,120
B.4596	5,590	B.3922	6,020
Sealy Seedling	5,260	Sealy Seedling	5,830
D.625	5,020	D.625	5,430
B.254	4,990	B.156	5,130
B.6450	4,930	B.1528	5.010
B 109	4,920	B 254	4,990
B.1528	4,800	B.208	4,960
B.3696	4,650	B.1355	4,880
B,147	4,580	D.109	4,860
B.156	4,580	B.3696	4,830
B 208	4,560	D 1111	4,820
B.1355	4,560	B.1753	4,760
B 3747	4,530	B 306	4,750
B.6346	4,530	B 376	4,750
D.109	4,490	B 6450	4,750
B.3675	4,340	B.109	4,660
B.376	4,290	B.6346	4,560
D.116	4,280	B.393	4,550
D.130	4,280	White Trans.	4,550
B.1753	4,230	B.3747	4,530
A.95	4,100	D.116	4,500
		B.147	4,400
		B.3675	4,370

The following table shows the results of the first twenty ratoon canes in 1911-12 together with the averages over the past five years

It was seen that B.758 and B.147 occupied the first and second places in the year's results; these, however, made the means for three stations only, the canes having died out elsewhere during the drought. Leaving these out, B.4596 occupied the third place with a return of 3,400 lb. of sucrose to the acre Sealy Seedling, B. 376 and D.95 also occupied satisfactory positions on the list

Means for 1911-12.		Means for past 5 years.	
Name of cane	Sucrose, lb. per acre.	Name of cane.	Sucrose, lb. per acre.
D.758	3,630	B 4596	3,550
B.147	3.620	B 306	3,310
B.4596	3,420	B.1521	3,300
Sealy seedling	3,300	D.109	3,230
B 376	3 220	B 156	3,200
D 95	3,200	B 6460	3,190
B 6450	3,190	B.376	3,120
B 208	3,190	Sealy Seedling	3,110
B.306	3 070	B.109	3,090
B.3696	3,040	B.3096	3,040
B 109	2.970	B.147	3,020
D.790	2,920	B.208	2,930
B.1528	2,900	B 1753	2,840
White Trans	2,860	D.95	2,790
B.156	2,850	D 2190	2,750
D.125	2,690	D.116	2,720
D.625	2,670	D.625	2,710
D.109	2,520	D 758	2,630
D.130	2,470	White Trans.	2 610
B.1753	2,440	D.130	2,490

Mr. Tempany, at the close of his address, thanked the owners, attorneys and managers on whose estates the trials had been conducted, for the assistance they had afforded to the Department in carrying out successfully the sugar-cane experiments.

SUGAR PRODUCTION IN PERU.

Statistics obtained by sending blanks to be filled, to all the sugar estates in Peru, have recently been published, giving the production of sugar, alcohol and rum, the extent of the cultivation of cane, the number of workmen, and the wages in the sugar industry in 1911.

The data thus collected show that 1,285,170 metric tons of cane were milled in Peru during 1911, from which were made 22,525 tons of white sugar, 105,546 tons of granulated sugar, 21,936 tons of brown sugar, 1,026 tons of molasses, 782,713 gallons of alcohol, and 496 357 gallons of rum. The estimated production of those estates which did not furnish returns, and hence are not included in the foregoing figures, was: sugar, 27,500 metric tons; alcohol and rum, 848,000 gallons. The total production was therefore 178,533 metric tons of sugar and 2,127,070 gallons of alcohol and rum.

The area under sugar cultivation was 19,965 acres, and the average production per acre 16·8 tons; 16,977 hands were employed, each earning, on an average, 58c. per day.

In 1911 the exports of white, granulated, and brown sugar from Peru aggregated 123,786 metric tons having a total value of $7,081,061

According to figures furnished by the National Tax Collecting Co., 32,485 metric tons of sugar were consumed in Peru in 1911. (From a United States Consular Report, in the *Modern Sugar Planter*, December 28, 1912.)

FRUITS AND FRUIT TREES.

SUCCESS IN BUDDING CACAO IN DOMINICA.

Two articles that have appeared recently in the *Agricultural News* of November 9, 1912, and January 4, 1913, have signalized the successful budding of the mango and the avocado pear, respectively—the former by Messrs. Brooks and Niles, in St. Lucia, and the latter by Mr. J. Jones, in Dominica. Previous to the appearance of these articles, namely on September 9, 1912, Mr. Jones sent to the Head Office of this Department a description, accompanied by photographs, showing that he had been successful in propagating cacao by budding, in bamboo joints. Blocks for the reproduction of the photographs have been obtained, and now that these are available they are used for illustrating this article, on the next page.

The great importance of the budding of cacao is that it provides a much handier and more speedy method than inarching for the propagation of the plant, and enables a large number of plants of exactly the same kind to be raised quickly. The eagerness with which the discovery of a successful way of doing the work has been awaited is illustrated by the following extracts from papers by practical agriculturists and others interested in the subject.

The first is from a paper by Mr. Jones, entitled Grafted Cacao at the Dominica Botanic Station, appearing in the *West Indian Bulletin*, Vol. XII, No. 1, p. 81, issued January 15, 1912; it is as follows (p. 87):—

. . . . 'It is hoped, however, by those who wish to see the cacao industry placed on a firm basis, that the feasibility of budding cacao as easily and certainly as this can be done for citrus fruits will be attained eventually, for the following reasons.

'Grafting by approach entails a certain amount of additional labour and inconvenience, for the stocks have to be brought near to the selected trees, stages have to be erected around the trees for the accommodation of the stocks, and the plants after inarching require daily watering and attention for a period of five to eight weeks, according to the time of the year in which the work is being carried out. In addition, the grafted plants must be kept in a nursery for several weeks, after severance from the parent trees, before they may be planted in the fields. In drawing attention to these difficulties, it is not intended to discourage the adoption of this method of propagating cacao; for even with their existence, grafting by approach is well worthy of adoption. If, however, a way is found of budding cacao stocks from nine to twelve months old, growing in bamboo pots in nurseries, the operations connected with propagation would be simplified, the speed of work would be greater and the latter could be centralized and therefore more easily carried on. Another consideration in favour of budding is that a tree capable of yielding several hundred shoots for inarching during a season would give, in the same time, thousands of buds: hence the possession of a means of budding cacao would render the propagation of a given variety much more speedy than is at present possible with inarching.'

The second extract is taken from a paper by Dr. A. Fredholm, entitled the Practice of Renewal by Chupons, on p. 371 of the issue for last November of the *Proceedings of the Agricultural Society of Trinidad and Tobago*:—

'It may be argued that, as yet, no practical method of grafting or budding the cacao tree has been discovered. The only method which, so far, has proved successful has been inarching. This method is both cumbrous and expensive but, even then, I am convinced that it would pay. So little work has, however, been done on artificial vegetative propagation of this plant, that it would be a serious error to condemn a mode of propagation, which has given such uniformly good results with other plants. As yet, we can only be said to have proved the cacao tree amenable to vegetative production artificially produced. This in itself is a valuable discovery, and all that is now required is to inaugurate experiments and continue them until the right method from an economic point of view is discovered. Personally, I have not the slightest doubt, that experiments properly conducted by a man experienced in this kind of work would very soon lead to the desired result. So many and varied are the purely mechanical features of the practices of budding and grafting, that very few, indeed, are the plants to which suitable modes of applying either of these practices have not after a time been found. Many plants, which for long gave uniformly negative results, are now regularly propagated by these methods to great economic advantage.'

The third passage to which attention may be drawn appears in a paper by H. C. Henricksen, entitled Brief Notes on Recent Observations in Cacao Plantations, on page 433 of the December issue of the publication just mentioned:—

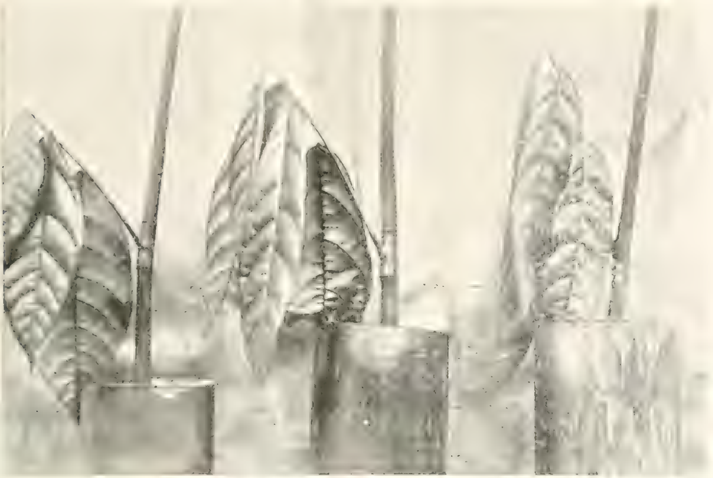


Fig. 1. Budded Cacao, Six Weeks after Budding.

'(3) In line with Dr. Fredholm's paper on renewal of plantations I would suggest that the cacao committee should try to induce the Department of Agriculture to secure a good propagator who should devote his whole time and attention to cacao propagation. The method of inarching is but a makeshift and it ought to be replaced by budding and grafting at an early date.'

It will be seen from the illustrations, which show budded cacao six weeks after budding (Fig. 1) and budded cacao after removal of the upper part of the stock (Fig. 2), that the method employed by Mr. Jones was patch budding, which has proved successful for the mango (see *Agricultural News*, Vol. VIII, p. 70). In forwarding the photographs to the Commissioner of Agriculture, Mr. Jones wrote: 'While the experiments show that budding cacao stocks in bamboo pots can be successful, it is by no means easy, and much remains to be learned by further observation and experiment. To the present patch budding has proved the more successful method. . . . . . Only a small measure of success has attended the experiments with T budding.'

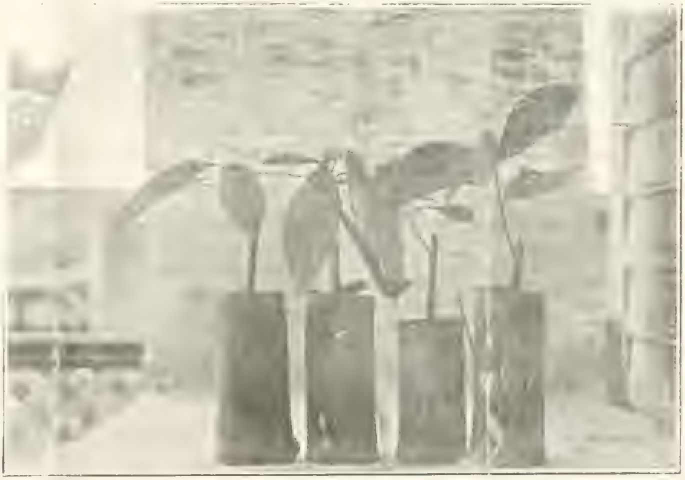
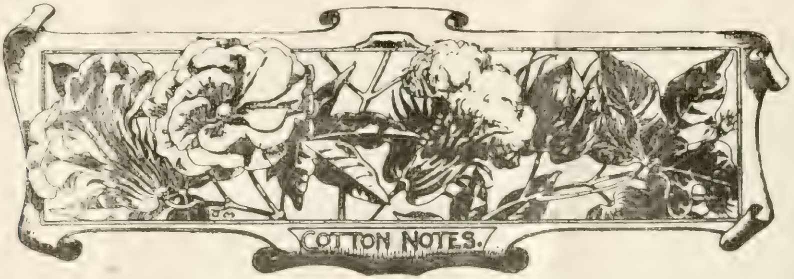


Fig. 2. Budded Cacao after Removal of Upper Part of Stock.

Mr. Jones's further results will be awaited with interest. It may be that the difficulties entailed through dealing with plants in bamboo pots will be made to disappear by the performance of the operation of budding on plants in beds, combined with the application of a successful method of transplanting the cacao from such beds. In any case, it is hard to gauge the great extent of the important economic effect that should arise from such work. It should enable cacao at last to be produced in standard qualities from large areas; so that the general level of the price will not be chiefly determined by the value of the product from the countries producing most of it, but cacao having the same 'mark' will be able to be grown on one large estate or group of estates and sold at a price determined almost solely by the reputation of that mark in the market.

An investigation described recently in the *Comptes Rendus de l'Académie des Sciences*, Paris (1911, p. 1215), appears to support the idea that green plants not only obtain their carbon from the carbon dioxide in the air, but from organic compounds in the soil. The experiments were carried out with plants growing in fairly dense shade, the supply of light being insufficient to form the carbon that was found in them; hence part of this element must have been absorbed by the roots.


COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date January 13, with reference to the sales of West Indian Sea Island cotton :—

A good business has been done in West Indian Sea Island cotton since our last report, and, although the enquiry is limited, prices remain firm. The sales amount to about 200 bales and include Montserrat and Nevis 16*d.* to 18*d.*, St. Kitts 18*d.* to 20*d.* and a few Barbados 17*d.* to 18*d.*

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending January 11, is as follows:—

There was some demand this week for the odd bags classing Extra Fine, Fully Fine and Extra Fine off in preparation at our quotations, the buying being on account of France and the Northern Mills. There was also some demand for tinged Islands, at 20c. on account of the Northern Mills.

This demand having been supplied, the market closed quiet, with Factors inclined to sell, wishing to dispose of some of their stock.

There has been no inquiry for the Planters' Crop Lots, which are nominally held at full prices.

We quote, viz.:—

Extra Fine	29c.	=	16½*d.*	c.i.f., & 5 per cent.
Fully Fine	27c.	=	15¼*d.*	" " " "
Fine	26c.	=	14¾*d.*	" " " "
Extra Fine off in preparation	26c.	=	14¾*d.*	" " " "
Fully Fine off in preparation	24c.	=	13¾*d.*	" " " "
Fine off in preparation	22c.	=	12¾*d.*	" " " "

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, to January 11, 1913, were *nil*, 196 bales, and 2,089 bales, respectively. Last year they were 2,831, 8,420 and 5,177 bales.

THE FUTURE OF AMERICAN COTTON.

Cotton spinners of all countries have for so long been dependent upon the United States for their supplies of raw cotton that American cotton growers, merchants and exporters have been led to believe that this state of affairs would continue indefinitely, and that the United States would fix the cotton prices of the world. Of the world's total consumption of raw cotton in 1911, which amounted to 19,013,000 bales, the United States supplied 11,408,000 bales, or almost 60 per cent., and all other countries only 7,600,000 bales. Such conditions, as is well known, have led to excessive gambling by speculators, which has so inflated prices as to be a serious menace to spinners, whose only hope is to be found in a free market, uncontrolled by speculative competition, with a supply furnished by many producers. Whether that hope is likely to be realized is considered in an interesting article by Mr. John V. Hogan in the *Journal of Political Economy*, of Chicago. He discusses the success that has so far been obtained in the various countries where cotton is produced and shows that, besides the great producers fifty years ago, seventy-two other countries are producing and exporting cotton on a rapidly increasing scale. Apart from India, Egypt, China, and Brazil, the remaining countries, where the industry is largely of recent development, have increased their production and exports from 797,550 bales in 1900 to 2,886,177 in 1910, an increase of over 260 per cent., and they are developing now at an even more rapid rate. In the same period the increase in the United States crop was only 17 per cent. There are probably no less than 1,800,000 square miles of good lands into which cotton culture is being profitably introduced in Russian and Chinese Turkestan and Mongolia, Mesopotamia, Uganda, and British East Africa, Rhodesia and Nyasaland, the Anglo-Egyptian Sudan, Abyssinia, the Congo, Nigeria and Madagascar. This means an area over thirty times as large as the entire cotton acreage of the United States in 1911, and yet it does not include sixty other cotton-producing lands which may be able to supply an equally large cultivable area. In the near future, therefore, it is probable that cotton will be growing in a great number of countries in sufficient quantities to meet the world's requirements, when the price will no longer be controlled by speculative interests. Mr. Hogan thinks that, under these circumstances, the future of the American cotton trade is now in the balance. The world's spinning industries, which have suffered so severely from the manipulation of the American cotton exchanges, have determined to obtain relief at any cost from further American control of the fibre. Much has already been done in that direction, and what the future will bring may be plainly foreseen. In 1889 the United States produced 63½ per cent. of the world's output of cotton, in 1909 it was 59½ per cent., and in 1912 it will probably be about 58½ per cent. Apparently it will not be many years before the American crop will be less than one-half of the world's production, and unless the United States can greatly increase its crops by improved methods of cultivation and will sell the output at reasonable competitive prices in the open markets of the world, it will have to take a lower position in the list of the world's suppliers of cotton. (From the *Chamber of Commerce Journal*, December 1912.)

DOMINICA: REPORT ON THE AGRICULTURAL DEPARTMENT, 1911-12.

The outstanding features of the year under review are notable in several respects. Shipments of green limes continue to increase, improvements in grading and packing, combined with an increase of keenness on the part of the planters themselves, tend to establish the green lime trade as one of the foremost industries of the Presidency. The trade was started in 1894 when 232 barrels were exported at a value of £41; during 1911-12, 36,520 barrels were shipped, valued at £14,608.

Concentrated lime juice and citrate of lime constitute the chief exports at present, but the increase in production has, during the last year or two, been less than formerly; the value of these exports in 1911-12 was £42,273. Two factories equipped for making citrate of lime are already in existence, and with the establishment of a third, which is expected to take place in the near future, there will come an increase in the shipments of this valuable product.

A falling off has occurred in the export of cacao, chiefly because of the preference given by planters to the more hardy and profitable lime; nevertheless the growing of cacao appears to be well suited to the requirements of peasant proprietors, and considerable attention has been given to this matter by the Agricultural Department.

Amongst those industries which are being established are rubber and vanilla. The cultivation of vanilla has received a fresh impetus during the year under review, mainly through the enterprise of an owner of a private estate.

Another feature of the year is the discontinuation of the system of boarding pupils at the Agricultural School and the tranference of their work to the Botanic Gardens Agricultural and science instruction has also been introduced into the Dominica Grammar School, and this will doubtless be valuable in the agricultural interest of the Presidency.

Turning now from these external matters to the internal working of the Department, it is seen that its activities proceed along several distinct lines: maintenance of the gardens, work in the nurseries, plot experiments, work connected with insect and fungus pests and their control, special investigations, extension of interest in agricultural matters and agricultural instruction, are all included in the Department's scheme of activities.

Observations on some of the more noteworthy plants and trees in the Gardens occupy two pages in the report, where reference is made, amongst other matters, to the admirable practice of planting palms and ornamental plants in groups; attention is called to recent introductions of two new Mexican fruit trees from California, and to the establishment and distribution of the mangosteen tree. It is stated that, of the Indian trees established in the Gardens, a number thrive with great vigour. Several exotic mahogany trees are also well established. As the Honduras mahogany (*Swietenia macrophylla*) is superior to the common West Indian mahogany (*Swietenia Mahagoni*), seedlings of the former species will be available for distribution in due course.

The extent of the work in the Government nurseries will be comprehended by referring to the table giving the number of seedling plants sent out during the year. The average annual distribution of late has been 70,000 plants, of which 50,000 are lime seedlings, the remaining number being made up of cacao, rubber and budded citrus. Arrangements are being made to raise an additional 30,000 lime plants to meet the increased demand on the part of the planters. It is rightly pointed out that this increase of work in one section can only be of a temporary nature, and that the skill and energy of the Botanical Department will in the future be required for, and devoted to a greater extent, to the further development of other industries.

As regards the importation of plants, reference is made to the new varieties of Indian mangoes that have been secured. Two Mexican varieties of avocado pears have been received, and amongst other matters it is stated that efforts will be made in the future to distribute the valuable Japanese persimmon (*Diospyros kaki*).

The account of the plot experiments at the Botanic and Experiment Stations begins with trials with green dressings, of which the now well-known *Tephrosia candida* has given best results, whereas the chick pea (*Cicer arietinum*) has been shown to be unsuited to the conditions prevailing in Dominica. Following this information are notes on spineless limes, and under the heading of vanilla it is stated that expert knowledge in curing the fruit of this plant has recently been obtained owing to the enterprise of the owner of Canefield estate, and the Department has already supplied this estate with 8,000 cuttings, with a view to establishing a new and possibly important industry. Rubber plants continue to be raised at the Experiment Station, but reference is made to the very low rate of germination of imported Para seed. This seems to be due to the seeds being packed in large boxes instead of with damp charcoal in small tin boxes. Some interesting results of analyses of Dominica rubbers are given. The percentages of caoutchouc are as follows: Para, 93·4; Castilloa, 85·6; *Funtumia elastica*, 87·2; *Funtumia africana*, 47·2.

Plot experiments with cacao have been chiefly confined to grafting. It has been proved that a permanent union cannot be obtained between Monkey cacao (*Theobroma angustifolia*) and Calabacillo cacao (*Theobroma Cacao*, var.)—a very interesting result.

Work connected with plant pests deals entirely with the entomogenous fungi. Two new facts have been brought to light: first, that the white-headed fungus (*Ophionectria coccicola*) is found only on the newer estates in the interior and that it is not found on the older estates near the coast: and secondly, that the red-headed fungus (*Sphaerostilbe coccophila*) is found parasitic on the West Indian red scale (*Aspidiotus* sp.).

As regards general investigation work, reference must be made to the conclusive manurial experiments with cacao which still show in a convincing manner the great benefit derived from mulching in Dominica. An account of the results covers ten pages in the report, and they will continue to receive the careful attention of all planters of cacao. The important trials dealing with the extraction of lime juice by milling, carried out by the Superintendent of Agriculture of the Leeward Islands, also merit attention.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

The leading article in this number commences the consideration of the functions of water in relation to the life of animals and green plants. It is intended to develop the subject in an illustrative way, in the next number of the *Agricultural News.*

An interesting summary of the sugar-cane experiments conducted in Antigua during 1911-12 is given on page 35.

Pages 36 and 37 contain an illustrated article dealing with the propagation of cacao by patch budding, in Dominica.

The last report on the Dominica Agricultural Department is reviewed on page 39.

The Insect Notes, on page 42, complete the summary of entomological information given in this journal in 1912, and present a note on insect pests in the Virgin Islands.

On page 43, there appears an account of experiments that have been carried out in Ceylon for the purpose of ascertaining the effects of different kinds of tapping on the composition of the rubber obtained.

The Fungus Notes, which will be found on page 46, describe recent work that has been done in the course of a very thorough investigation of a plant disease, in India.

Boards of Industrial Training.

In the Report of the Board of Industrial Training (1911-12), of British Guiana, is given the syllabus of instruction for the evening technical classes arranged for the benefit of apprentices. Besides practical mathematics, economic geography and mechanical drawing, the syllabus includes a scheme of instruction in boat-building, pattern-making and motor engineering. It is stated that the attendance, compared with that in 1910-11, has been disappointing as regards number, but that it has been fairly regular; the majority of the students were of the apprentice class. During the past year the Board has addressed itself to additional questions arising in the course of its work, an important outcome of which has been the conclusion of arrangements by the Government whereby students from British Guiana are admitted to the Teachers' Training College in Jamaica. Efforts to introduce, in British Guiana, legislation for protecting registered masters and artisans against the unregistered class have not yet proved successful.

A similar board, having similar aims to those described above, exists in Trinidad, and its lines of activity are described in a recent issue of the Trinidad *Royal Gazette* (January 9, 1913). Information is given concerning office records, committees and the registration of artisans, and the various forms are appended for certificate, licence, and contract, of apprenticeship. Some of the best work of the Board can be done through its power to enter into agreements for procuring the training of boys by Licensed Masters. The periods of apprenticeship required for different trades are also given. A useful feature is that bursaries are offered for competition among the elementary schools.

Chlorosis in Plants.

An abstract of a paper by P. Mazé, Rust and Lemoigne, on chlorosis in plants induced by carbonate of lime, is contained in the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for October 1912.

In a previous number of this Bulletin (January 1912), reference was made to experimental work by Mazé on the chlorosis of maize, when it was pointed out that this yellowing of the leaves does not indicate a pathological condition but is physiological, resulting from very varied influences. The author was, however, able to certify that the absence of sulphur or iron, *per se*, is able to cause chlorosis in maize. Chlorosis has been generally attributed to the want of iron, and this has usually been remedied by the addition of sulphate of iron. The response to this treatment suggested the question as to whether the cause is not the lack of sulphur rather than the lack of iron.

It is well known that calcareous soils play an important part in producing chlorosis in certain plants, and Mazé showed that the desulphuration of the soil through the formation of insoluble calcium sulphate is one of the causes of chlorosis.

Consequent on this, the three investigators referred to above have conducted wider enquiries into the cause of chlorosis as manifested in lime soils generally.

Vicia narbonensis was grown successfully in water cultures containing all the essential elements for proper nutrition. The solution contained no carbonates. When, however, calcium carbonate was added to the culture solution at the rate of 2 per thousand, the plants became regularly chlorotic after producing half a dozen normal leaves. Drops of a solution of ferric nitrate at 0·2 per thousand deposited on the discoloured leaves caused the appearance of chlorophyll after three days. Magnesium sulphate does not exert any action on this chlorosis. It is therefore the calcium carbonate that has produced the chlorosis by the withdrawal of iron.

The explanation of these facts is as follows. In the solution supplied with the calcium carbonate, the iron is made entirely insoluble. Certain plants like maize possess the property of absorbing it by means of the acid secretion of their roots (malic acid in maize). Other plants like lupin or *V. narbonensis* are incapable of utilizing the unavailable iron and hence become chlorotic. A similar incapacity on the part of the sugar-cane may possibly explain the presence of unproductive patches in cultivated fields, such as those in Antigua (where they are called 'gall patches'), particularly since these affected areas are, in the special instance mentioned, confined to the limestone districts of the island.

The Improvement of a Useful Grass.

The Report of the American Breeders' Association, Vol. VI, 1911, contains an article by L. A. Moorhouse on the selection of Devil's grass (*Cynodon Dactylon*), called in the United States Bermuda grass. In West Indian agriculture, Devil's grass is one of the most noxious weeds of arable land, but it is of value as a pasture grass and indispensable as a grass for lawns. It is also useful for covering banks of sand and similar situations where excessive erosion or washing is likely to occur. From these points of view much benefit can be derived from careful selection.

For pastures a type should be selected which produces a dense growth of upright stems; for the prevention of washing, plants with a vigorous underground system should be selected; whilst a type which forms an exceedingly close turf is best suited for growing on lawns.

The initial step towards obtaining improved strains is to select a hundred, or even more, plants which appear to possess the desired characteristics; it will be well to obtain these mother plants from different localities, noting the rainfall and kind of soil of each situation. The cuttings from these plants should be planted in good, but not heavily manured soil, at a distance of 2 feet by 4 feet. The cuttings from one individual plant should be confined to one row, and a nursery number given to each plant.

After one or two seasons, those plants which correspond in a measure to the desired ideal, can be transplanted by cuttings into larger plots. From this area material will be available for general field planting.

Barbados Education Gazette.

The first number of this publication was issued on January 15, 1912, under the authority of the Barbados Education Board. It contains sixteen pages of printed matter arranged in a useful and suggestive manner, such that the magazine possesses an educational value quite apart from its function as a medium for the announcement of purely official information.

The matter relating to nature study, psychology and moral instruction is to be commended, for along these lines lie the main problems of West Indian education. It is apparently the aim of the *Education Gazette* to keep these problems in view, and there can be no doubt that, in time, this policy will engender a wider appreciation as to what education really means.

The Student's Corner and other sections dealing with scholastic matters are likely to serve a useful purpose, but it would possibly be better to publish the answers to questions given in the Student's Corner, not in the same, but in the following issue of the publication.

The magazine is well edited, and except for one or two printer's errors (pp. 2 and 11) and the absence of a reference to page 13 in the table of contents, the publication is free from mistakes.

Rhizobia in the Soil.

In the *Experiment Station Record*, Vol. XXVI, No. 9, reference is made to investigations by R. Greig-Smith, in New South Wales, on soil fertility. It is stated that the most numerous nitrogen-fixing organism in the soil is Rhizobium, which occurs to the extent of 3 to 4 millions per gram, and that the number present affords an indication of the comparative fertility of the soil. The effect of cultivation is to increase greatly the number of these organisms in a given soil.

These facts regarding the nitrogen-fixing power of Rhizobium require attention when consideration is given to the similar effect of the Azotobacter organisms —an effect which, it will be remembered, is increased temporarily by the partial sterilization of the soil by antiseptic substances like ether, toluene and carbon bisulphide.

Science Instruction in British Guiana.

The Report of the Local Examinations and Lectures Syndicate of the University of Cambridge on science instruction in Queen's College, British Guiana, receives attention in a Report from that Colony on the examinations of Queen's College in July 1912.

The part of the report dealing with science subjects shows that in chemistry the work sent in was good, though some weakness appeared in the matter of illustrating answers by clear diagrams. The results obtained in the practical examinations were also satisfactory. In botany good answers were sent up, and very good accounts were written of the specimens set for description.

On the whole, the science work is said to show evidence of proper teaching from the beginning, and the boys have reached a satisfactory standard.

INSECT NOTES.

SUMMARY OF ENTOMOLOGICAL INFORMATION IN THE AGRICULTURAL NEWS IN 1912.

This summary is continued, as was promised, from the last issue of the *Agricultural News*.

Certain insects, and other forms of life will now be considered, in relation to their harmful nature, under their special headings.

THE MELON OR COTTON APHIS. Under this heading an account of this insect, taken from Bulletin 34 of the University of Nebraska, reviews the nature of the injury caused to melons and cotton, and some of the measures found useful in the control of the pest.

EEL WORMS. These minute, soil-inhabiting worms were considered in two articles which reproduced the summary of Bulletin No. 217 of the Bureau of Plant Industry of the United States Department of Agriculture. Eel worms are widely distributed and are known to attack a great variety of plants. The injury caused by them has not often been recognized in the West Indies, but it seems probable that careful observations may reveal the fact that they are more injurious than is suspected.

TICKS. Two articles on Ticks have also appeared during the year (see pp. 394 and 410). These reproduce portions of Bulletin 106 of the Bureau of Entomology of the United States Department of Agriculture, and contain interesting and useful information with regard to a group of pests which though well known to planters in the West Indies do not appear to receive at the hands of owners of stock the attention which from their importance they deserve.

The attention of the Reader is now drawn to general matters that have been dealt with in the Insect Notes.

GENERAL. The following articles may be grouped under a general heading.

Plant Protection in the United States is the title of an article (p. 330) in which the need is shown for legislation for the prevention of the introduction of pests and diseases in connexion with imported plants. The article is taken from Circular No. 37, Office of the Secretary, United States Department of Agriculture.

A method used in the Philippines for the control of Termites is discussed at page 122. This consists of the use of the fumes of sulphur and arsenic forced into the nests and galleries of the termites by means of a special pump.

A carbon bisulphide explosion is the subject of an article (p. 186) giving an account of a disastrous effect resulting from the use of this insecticide in a closed building containing grain in which a high temperature had been produced by fermentation.

The successful use of formalin in North Carolina as a poison for the house-fly is noted on p. 58, and in Trinidad at p. 314.

A disease of grasshoppers reported to produce fatal results to such an extent as to enable it to be used for the control of outbreaks of these insects in Yucatan, is discussed at p. 170. The control of the citrus mealy-bug (*Pseudococcus citri*) by natural enemies in California is mentioned on p. 252, the information being taken from the *Monthly Bulletin* of the California State Commission of Horticulture.

An account of twig girdlers of the genus Oncideres will be found on page 250, of the canna or arrowroot worm (*Calpodes ethlius*) on p. 186; and the record of a new pest of cowpeas in Barbados on p. 234. This is a small moth, *Ballovia cistipennis*, the larva of which tunnels in the terminal buds, stems and pods of the cowpeas, inflicting serious injury.

The distribution of the yellow fever mosquito (*Stegomyia fasciata*) throughout the tropical and sub-tropical portions of the world is noted at p. 202, where also will be found brief mention of the preparation of the so-called silk fish lines from the silk glands of the larvae of certain large moths, *Saturnia pyretorum*, in Japan.

The jumping beans of Mexico in which the remarkable activity of the bean is caused by the movements of the larva of a small moth, *Carpocapsa saltitans*, are mentioned in an article on p. 378.

In New Zealand the larva of *Odontria zealandica* has become a serious pest from its attacks on the roots of grasses. An account of this insect and mention of several related species in other parts of the world will be found in an article entitled The New Zealand Grass Grub (p. 58).

A NOTE ON INSECT PESTS IN THE VIRGIN ISLANDS.

Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands, recently paid an official visit to the Virgin Islands. The following notes, with regard to insect pests, which have been submitted by him to the Imperial Commissioner of Agriculture are published, herewith, as being of interest to readers of the *Agricultural News*.

The following observations connected with insect pests in the Virgin Islands may be of some interest, as the conditions present a field which up to the present has been explored to a very limited extent.

At the time of my visit, when a period of continued heavy rains had followed a prolonged time of severe drought, insect life of all kinds was particularly abundant.

On cotton, the cotton caterpillar (*Alabama argillacea*) was found to be present abundantly in Tortola and Virgin Gorda; the severity of the attack is such that it was found necessary to organize methods of combating the pest by means of insecticides; in previous years such steps do not appear to have been necessary, natural enemies having exercised a fairly efficient control. The conditions under which cotton is usually grown in the Virgin Islands are such that the areas cultivated consist largely of isolated small plots surrounded by high bush; such a set of conditions seems particularly favourable to natural methods of control. An important factor in the control of cotton pests appears to lie in the prevalence of the bird known locally as black witch (*Crotophaga ani*). There is a large mason bee which apparently is also predaceous, while Jack Spaniards are abundant. Other pests of cotton were not found to be specially abundant, though some damage was recorded by cut worms and also by a small grey weevil differing apparently from that which was responsible for similar damage in Antigua.

Limes, whenever seen, were on the whole remarkably healthy and free from scale insect attacks. Some purple, green, and white scales were seen but only in small quantities; the black fungus (*Myriangium Duriaei*) was observed to be plentifully present in lime cultivation, but neither the red-headed nor the white-headed fungus was seen. The shield scale fungus (*Cephalosporium lecanii*) was observed however to be present in great quantity, parasitic on the mango shield scale and other Lecaniums in and surrounding the Experiment

Station. A yellow weevil, found attacking the leaves of lime trees, was responsible for some small amount of damage at various points; the insect itself is new to me.

In Virgin Gorda sweet potatoes had been very badly damaged by the ordinary sweet potato hawk moth (*Protoparce cingulata*); while at the Experiment Station some damage had been done to arrowroot by the arrowroot worm (*Calpodes ethlius*).

The Jack Spaniards mentioned above are probably *Polistes* sp., perhaps *P. fuscatus-instabilis*, which occurs commonly in the Leeward Islands, but probably not the same species as *P. annularis*, which is so valuable as a natural enemy of the cotton worm in St. Vincent and Barbados. The scale insects of limes mentioned are the purple scale (*Lepidosaphes beckii*) [Mytilaspis citricola], the green scale (*Coccus viridis*) [Lecanium viride], and the white scale, *Chionaspis citri*.

The yellow weevil, mentioned as attacking the leaves of lime trees, is a species of Diaprepes quite different from the root borer (*D. abbreviatus*) of sugar-cane in Barbados, resembling *D. spengleri* but apparently being distinct from it. The grub of *D. spengleri* is reported to attack roots of orange and other citrus trees in Porto Rico, and it also occurs in St. Vincent, where, however, the habits of the grub do not seem to be known.

Agricultural Development in the United Kingdom.—Speaking at the annual dinner of the Farmers' Club on Tuesday, December 10, Mr. Runciman, President of the Board of Agriculture and Fisheries, referred to the assistance which the Development Commissioners propose to give to agricultural research. In the course of his remarks, he said: It was not enough merely to adopt a policy of slaughter, scheduling areas, and so forth. They should adopt so far as possible all the services that science could supply. They must give their research institutions, universities, and colleges the needful to ascertain more and more the nature of their most dangerous diseases. He had received permission only that day to announce that one of the schemes he had been enjoining for some months in the country had so far met with the approval of the Development Commissioners that they would shortly recommend to the Treasury a release from the Development Fund of moneys for the following objects: First of all to provide in every one of what were now called the provinces, for the purposes of agricultural education, the services at the headquarters of those provinces of men concerned with advice as to soils, crops, and so forth, but who should be concerned also with live stock; that each one of these men should be an organizer or supervisor, to organize in that province a live stock scheme which would be described in further detail. The Commissioners were also prepared to enable them, with an annual sum, to have engaged in their office a man of the highest class, who could not know everything about every branch of live stock, but, by general knowledge, would be able to give administrators advice, which at present they were without. Thirdly, premiums would be provided from the Development Funds for the breeding of heavy horses, Shires, Clydesdales, Suffolk Punches. (From *Nature*, December 12, 1912.)

EFFECT OF TAPPING UPON THE COMPOSITION OF RUBBER.

Recently, samples of rubber prepared by different methods, by the Ceylon Agricultural Department have been sent to the Imperial Institute for examination, and the present article is based upon an account of this examination which appears in the *Bulletin of the Imperial Institute*, Vol. X, No. 3.

The tapping of the trees was performed (1) by the knife only (excision), (2) by the pricker only (incision), and (3) by a combined method. using both knife and pricker.

In the first series of experiments, the first specimen consisted of Para crêpe obtained by the use of the knife only, V and half-spiral cuts being made. This rubber was light-brown in colour and exhibited good elasticity and tenacity. It contained 94 per cent. of caoutchouc and a relatively low percentage of ash. It was valued in London at 4*s* 6*d*. per lb., with fine hard Para at 4*s*. 3*d*. per lb.

The second sample was Para crêpe obtained by V and half-spiral cuts with Bowman-Northway knife and pricker. This was thin crêpe rubber varying in colour from light to dark-brown. The rubber exhibited very good elasticity and tenacity. It contained 94 per cent. of caoutchouc and a relatively high percentage of ash. It was valued at the same price as the first sample.

The third was Para crêpe obtained by vertical cuts and Kelway Bamber's pricker. This was dark-brown, thin, crêpe rubber, which was apparently not quite as strong as the two preceding specimens.

All the samples, especially No. 3 prepared by making vertical cuts, were rather dark in colour for plantation crêpe.

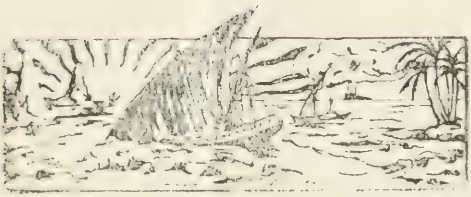
Specimen No. 4 of the second series consisted of rubber biscuits from trees tapped with the knife only. These were thin, light-coloured biscuits, clean and well prepared, but showing white surface marks. The elasticity and tenacity of the rubber were very good. It contained 91·6 per cent. of caoutchouc, and the amounts of resin, protein and ash were somewhat high.

Sample No. 5 consisted of rubber biscuits from trees tapped with Bamber's pricker: thin light-brown biscuits, clean and well prepared; a few of the biscuits showed white surface marks. The physical properties of the rubber were very satisfactory. As regards composition this sample contained 92·1 per cent. of caoutchouc with rather high percentages of resin, protein and ash, though the loss on washing was considerably lower than in the case of sample No. 4.

These two samples were valued at about 4*s*. 11*d*. per lb. in London, with fine hard Para at 4*s*. 8*d*. per lb.

Following on the above information in the account already referred to, is a description of a chemical examination of rubber from *Manihot dichotoma*. This has been said to be superior to *M. Glaziovii*, the well-known Ceara rubber tree, as a source of commercial rubber. Recently, some trees of *M. dichotoma* were tapped for the first time. The sample sent to the Imperial Institute consisted of four pieces of dark-brown, thick crêpe rubber. Two of the pieces exhibited fairly good physical properties, but the other two were soft, sticky, and very weak. Rubber represented by the two best pieces of this sample would probably realize about 4*s*. per lb. in London, with fine hard Para at 4*s*. 3*d*. per lb. The rubber contained 84·6 per cent. of caoutchouc, and the percentages of resin, protein and ash were relatively high.

It is believed that this rubber was obtained from very young trees, and that the product may improve as the trees increase in age.



GLEANINGS.

A Law of St. Lucia, entitled An Ordinance to Regulate the Importation of Bees (No. 8 of 1912) was gazetted as having come into force, on December 7, 1912.

A note in the *International Sugar Journal* for December 1912, states that the exports of sugar from Peru in 1909 amounted to 125,351 tons, value £1,159,899. Most of this sugar went to Chile, while the United Kingdom was the second largest customer.

Information has been received from the Curator of the Botanic Station, Montserrat, to the effect that the continued rain has maintained the growth of the cotton crop and the fields have flowered again profusely. The total crop for the present year promises to be higher than was anticipated.

Serious damage to the lime nurseries in St. Lucia was caused by the heavy rains that fell on December 7. Special efforts are being made to resow lime seeds and save the seedlings not beyond recovery. It will be remembered that similar damage was occasioned by the October flood mentioned in the *Agricultural News*, November 23, 1912.

A consular report has been issued in Belgium which draws attention to the fact that the consumption of cotton by Russia amounts to about 400,000 tons yearly. The Russian Government is making special efforts to protect cotton production in that country and to encourage it, so that the importations from abroad may be lessened as much as possible.

Among the improved weighing machinery exhibited by Messrs. Avery, Ltd , at the recent Smithfield Cattle Show, was a scale for the weighing in or weighing out of goods, having a printing arrangement attached by means of which the weight is indelibly printed on a ticket at the time of weighing, so that the likelihood of disputes between the buyer and seller is lessened.

The British Vice-Consul at Ensenada, Lower California, reports favourably on the possibilities for cotton-growing in Southern California and the adjacent province of Mexico. It is stated that under irrigation, which is now provided, the area is supposed to be able to produce about 500,000 tons of high-class cotton in each year. Mention is also made of another district to the south which is three times as big, and may probably eventually produce a large amount of the crop.

The Board of Trade Journal for December 19, 1912, states that the value of the rice exported from Siam in 1911-12 was £4,989,458, which is lower than in any year since 1905-6. The quantity was 627,467 tons, and this was lower than the amount in any year since 1903-4. When compared with those of 1910-11, the figures show a decrease of 419,459 tons and £1,970,531.

A communication received from the High Commissioner in England for the Commonwealth of Australia states that, with a view to preventing the introduction of foot and mouth disease, 'a recent proclamation of the Federal Executive Council prohibits the absolute introduction of hay and straw for fodder purposes into Australia. Formerly hay and straw could be introduced into Australia under a special license.'

In a short note in the *Experiment Station Record* for July 1912, mention is made of investigations that have led to the conclusion that the commercial preparation known in England as Raticide, and in America as Azoa, cannot be recommended for destroying rats. This is in accordance with other experience with special preparations for rat destruction that has been given attention from time to time in the *Agricultural News.*

It is stated in *Peru To-day*, for December 1912 that certain beetles resembling the hard back beetle, which are found in great quantities near Quito, are toasted by the natives and eaten as a delicacy. They are also sold in the streets just as nuts would be. The taste is said to be very much like toasted bread with no particular flavour. This custom is analogous to the practice of some of the natives of British Guiana, of consuming the gru-gru worm.

Extensive field trials have been carried out recently by the Department of Agriculture and Technical Instruction for Ireland to test the yielding capacities and quality of certain French and Danish varieties of wheat. The work, which was carried out in a very thorough manner, showed that during 1911-12, the Danish variety Queen Wilhelmina, gave the best results, and it is recommended for the attention of Irish wheat growers.

Aluminium nitride has been referred to already in this journal (*Agricultural News*, Vol. IX, p. 188) as a possible manure. In *Engrais*, 1912, p. 577, a discussion is given of the production of this substance as a practical means of fixing the nitrogen of the air. It is indicated that aluminium nitride may become useful in agriculture on account of the facts that it contains about one-third of its weight of nitrogen and that it can be produced fairly cheaply.

The Agricultural Research Institute, Pusa, has issued recently Bulletin 29, which contains directions for the cultivation of Eri silk. It is stated in the preface that the Bulletin is written to provide rearers and intending rearers of Eri silkworms with a brief practical manual on the subject. A more detailed account is to be found in the Memoir on Eri Silk published as Part I of Volume IV of the series of entomological memoirs issued by the Department of Agriculture in India; and those who require fuller details are referred to this work.

STUDENTS' CORNER.

An instructive experiment to show, without a microscope, the presence of minute forms of life (bacteria) in the soil is the following. Obtain three clean, wide mouthed medicine bottles and label them 1, 2 and 3. Place in No. 1 a little fresh soil, in 2 a freshly prepared but weak solution of meat juice. Then plug the mouths of the three bottles with absorbent cotton and on three consecutive days stand them for an hour in boiling water, taking care that the water is heated gradually and that only steam comes in contact with the cotton plugs. During the intervals between these sterilizations, the bottles should be placed in a clean cupboard. On the fourth day take bottle No. 3 outside and by means of a clean iron spoon (which has been dipped, for preference, in alcohol which is then lighted) add as quickly as possible a tiny lump of soil which must be taken from just below the surface. Replace the plug immediately. Arrange the three bottles in a row in the cupboard and set light to the cotton plugs, and then quickly blow the flames out, in order to sterilize the plugs. Next add about half the sterile meat extract in No. 2 to the unsterilized soil in No. 3, and a minute portion of the sterile soil in No. 1 to the remainder of the sterile meat extract in No. 2. On the fifth day, if the experiment has been done quickly and cleanly enough to prevent contamination from dust, etc., there should be gelatinous patches, or even a film, covering the surface in No. 3; whilst the liquid in No. 2 should still remain unchanged. These patches are composed of millions of bacteria, and the offensive smell of the liquid in No. 3 is an indication that certain chemical changes have occurred as the result of the bacterial development

Reference has been made already in these notes to land, capital and labour (see *Agricultural News*, Vol. XI, p 301). Where the landowner manages his own estate, his net income is composed of rent, profit on invested working capital, and salary for his own services. Do not confuse rent, profit and wages. If the estate is rented to a tenant, then, obviously, the landlord's return consists of rent alone; if the estate is managed for him by others, then the value or part of the value of his own services goes to the manager and attorney. In business, more especially in partnership concerns, it is customary to charge the business with interest at the rate of 3, 4 or 5 per cent. per annum on the capital; for the capital would yield this interest if invested in stocks and shares.

Book-keeping is the art of recording in writing the accounts of a business; and its object is to show, after a given period: (a) how much has been gained or lost during that period; (b) on what accounts gain or loss has been made; (c) the amount owing to or by each person traded with; (d) the amount of stock and cash on hand.

The mere noting down of every transaction in chronological order in a diary is evidently insufficient: as transactions accumulate, a systematic record and classification of them is required. The foundation of successful book-keeping is the principle of double entry. That principle is as follows. In every business transaction (as e g. the exchange of cotton for cash) there is simultaneously both an increase and a decrease of property (e.g. increase of cash, decrease of cotton), and the increase is equal to the decrease. The record or entry of both these effects is the double entry—the cash account because it receives, is debtor to the cotton account; and the cotton account, because it gives, is credited by cash account.

The double entry system is not employed on the majority of estates in the West Indies, partly owing to its complexity and the work it involves, and partly because of the difficulty of devising a system which is generally adapted to the different estate conditions. In any case, whether the system be applied in practice or not, the educational value of a knowledge of it gives a scientific insight into the relations of the different kinds of transactions and operations to one another, and enables the student to appreciate the real significance of profit, credit, accumulation of capital, depreciation, interest, discount, consignments, insurance, and similar matters of finance.

The student, therefore, is advised to obtain a text-book on book-keeping such as *Book-keeping for Estate Students*, by Thomson (London: G. Bell & Sons), and to work out theoretical examples. This should be followed by an endeavour to arrange a simple system of double entry accounts adapted to the conditions of any particular estate.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) State how stems are modified for different uses.
(2) How may the pressure of the air be shown?

INTERMEDIATE QUESTIONS.

(1) Contrast the effects of flowers of sulphur and of sulphates when applied to the soil.

(2) Describe how you would pack for export either (a) green limes, (b) Para rubber seeds; or (c) cotton, (d) molasses.

FINAL QUESTIONS.

(1) State what you know concerning Sakellarides cotton. In what way does its production affect the demand for Sea Island cotton?

(2) Distinguish between the selection of plants and the grading of produce. Give examples of each. Discuss the financial benefits that may be derived from the employment of these practices.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados on Saturday, January 25, by the S.S. 'Korona', from an official visit to St. Lucia.

Agricultural Education in Italy.—By royal decree the Higher Council of Agricultural, Industrial and Commercial Instruction in Italy was abolished in December 1911, and a Council for Agricultural Instruction substituted. The new Council is to consist of fourteen members appointed by the Minister of Agriculture, and is to give advice regarding proposed legislation and general provision for agricultural instruction, agricultural schools of all kinds, aid to students, and other questions relating to agriculture, forestry, and zootechnical studies which he may refer to it. (*Journal of the Royal Society of Arts*, December 20, 1912.)

FUNGUS NOTES.

RECENT WORK ON A PLANT DISEASE.

In the *Memoirs of the Imperial Department of Agriculture in India*, Botanical Series, Vol. IV, No. 6, an account is given by Shaw of his investigation into the existence of physiological races of the fungus Rhizoctonia which has been found to be parasitic in India on the ground nut, cowpea, jute and cotton.

Before proceeding to describe the important results that have accrued from this investigation, it may prove helpful to sketch the position regarding the identity and parasitism of Rhizoctonia that existed previous to the commencement of Shaw's researches.

Rhizoctonia is a form genus which was established by de Candolle in 1815 to include certain sterile (i.e fruitless) fungi occurring upon the roots of plants; though the first reference to Rhizoctonia was made by Duhame, who, as early as 1728, described a disease of saffron (*Crocus sativus*), and considered the sclerotia, or spherical masses of mycelium typical of Rhizoctonia, to be a special plant of which the hyphae were the roots. He named the plant Tuberoides.

Since de Candolle's time the genus Rhizoctonia has received considerable attention by mycologists in Europe, and various forms were described at some length by the Tulasnes (1851) and by Kühn (1858). The disease was recorded in Denmark during 1886 and 1902 on hosts belonging to widely different natural orders, and recently the parasitism of the fungus has been investigated in Sweden by Eriksson, in connexion with the considerable variability in the susceptibility of different varieties of one kind of host to the disease. In England, Gusson has described the disease on several plants, and he considers *R. solani* (Kühn) and *R. violacea* (Tulasne) to be one and the same species; whereas Massee, subsequent on Hartig's observations, suggests that Rosellinia is the fruiting stage of Rhizoctonia.

In America, Rhizoctonia is known to attack much the same crops as in England, and has been investigated by Duggar and Stewart; but the most interesting of the American publications on Rhizoctonia is that of Rolfs, who recently discovered a fruiting stage which he stated to be a basidiomycete already known to science as *Corticium* [illegible], B. and C.

Such was the position relating to the indentity of the fungus up to about 1910; and it must be admitted that considerable doubt prevailed as to what were the true perfect forms.

It has been stated already that the disease has for years been observed on a large number of different species of host plants, and the following lists of hosts show the remarkable distribution of the disease, both geographically and biologically: In Europe and America, Rhizoctonia attacks sugar-beet, bean, carrot, cabbage, cotton, lettuce, potato, radish, sweet potato, pumpkin, watermelon, garden pea, and alfalfa. More recently, Shaw, in India, has observed the disease on the following: ground nut, cowpea, jute, soy bean, cotton, bonavist bean (*Dolichos Lablab*), *Tricosanthes cucumerina*, and mulberry.

In view of the importance of cotton, ground nuts and cowpeas in the West Indies, the remaining part of this article will be concerned with Shaw's work on the Rhizoctonia disease of these crops and will end with a short account of his conclusions as to the identity of the causative organisms.

COTTON. Infected seedlings have a soft yellow patch on the lower portion of the hypocotyl, and in bad cases the rot is sufficient to cause collapse of the seedling. The similarity will be noticed between this 'damping off' and that caused by Pythium; indeed, incidentally it may be stated that most investigators now consider that many of the 'damping off' diseases attributed to Pythium are really caused by Rhizoctonia.

In India, Rhizoctonia does not attack *desi* cotton (a variety of *Gossypium neglecta*) in the field; it seems to be restricted to pot cultures of special varieties. Diseased plants may recover, but a second attack on the same plant never takes place. Seedlings seem to be susceptible only when quite young.

An examination of withered seedlings shows hyphae of Rhizoctonia. The branches tend to lie parallel, are closely septate and are constricted at the base—characteristic of Rhizoctonia. The sclerotia are rounded bodies, exactly like the sclerotia found by Shaw on jute seedlings, but rather smaller, the average diameter being about 90 microns. On agar-meat-extract medium the sclerotia may measure as much as 150 microns in diameter. After discussing the views of American authors and of Balls in Egypt, Shaw comes to the conclusion that cotton is attacked by Rhizoctonia in America, Egypt and India, and the section of his paper dealing with cotton concludes with an account of inoculation experiments in which it is shown that: (1) no successful inoculations took place on *desi* cotton in the field; (2) grown in pots, inoculated *desi* cotton showed a mortality of 20 to 30 per cent.; (3) 'khaki' variety grown in pots gave a mortality of 90 per cent.

GROUND NUT. Rhizoctonia was originally observed on the 'seeds' of this plant. The pericarp had a mottled appearance showing discoloured patches. Hyphae were found in the pericarp and also within the embryo. Portions of pericarp were incubated in sterile petri dishes and a vigorous growth of Rhizoctonia hyphae was obtained, which resembled the Rhizoctonia of cotton and jute.

Four of these infected seeds were sterilized with formalin and kept moist, but only one failed to succumb to the disease. Later in the year infected ground nut plants were found on the Pusa Farm; the upper portion of the plants appeared brown and withered, while at the ground level, the stem was of a dark-brown colour; in this portion hyphae and sclerotia of Rhizoctonia were particularly abundant. The morphological features of the Rhizoctonia of ground nuts agreed exactly with those of the fungus on cotton and jute. In the inoculation experiments, about 30 per cent. of the inoculations were successful. If the ground nut was first wounded the percentage of deaths reached as much as fifty; this plant also seemed particularly susceptible to attack at the growing-point.

COWPEA. The symptoms of attack in the case of this plant are the same as those already described for the ground nut, and the fungus also resembles that of the other three hosts. In the early stages of infection a red-brown discoloration appears upon the stem and slowly spreads; the stem ultimately becomes flaccid and collapses. Sclerotia are formed abundantly. Infections from agar cultures on unwounded plants gave an average mortality of 50 per cent.; by wounding, the mortality reached as high as 80 per cent. of the infections.

Leaving the consideration of the behaviour of the fungus on various host plants, attention may now be given shortly to the parts of the work that dealt with cross-inoculations, and the identity of the fungus.

CROSS-INOCULATIONS. Ericksson, working in Denmark, was able to make Rhizoctonia pass from the carrot to the beet. Its virulence upon beet, however, was greatly increased after being parasitic upon that plant for one generation, thus showing a gradual adaptation to the new host. Clover, which is sometimes attacked in Denmark, he was not able to infect with Rhizoctonia. Ericksson's results show therefore a very slight specialization in the parasitism on different hosts.

Shaw's results in India agree more or less with those of Ericksson. In those of the hosts, namely, ground nut, cotton and cowpea, the infection powers of the respective Rhizoctonias seem to be of a like order. In each case reciprocal infections were obtained, although the virulence of the fungus is greatest on its own particular host. Thus the Rhizoctonia from cotton, if infected upon ground nut, jute or cowpea, causes a mortality of about 40 to 50 per cent., but upon cotton it produces a mortality of 80 per cent. The Rhizoctonia of jute shows a high degree of specialization, as it does not attack the other three hosts at all under ordinary circumstances. Shaw records several interesting facts regarding host reaction. Jute reacts to cotton and cowpea infection by cork formation; and when the cowpea reacts successfully against the fungus, the hyphae appear to remain in the intercellular spaces; whereas when Rhizoctonia proves fatal, the hyphae penetrate the living cells.

In the light of these facts it is evident that physiological specialization of the fungus exists, unaccompanied by any outward morphological distinction.

IDENTITY. In his discussion of the identity of the fungus, Shaw arrives at the conclusion that the species which attacks jute, cotton, cowpea and ground nut is *R. solani*, Kuhn. Shaw is, however, able to corroborate Rolf's assertion, that a basidiomycetous form occurs, possessing vegetative characteristics similar to those of Rhizoctonia; but this particular form possesses sclerotia which are much larger than those belonging to *R. solani.* This form is called the macrosclerotial form and has been identified by Shaw as *R. violacea* of which the fertile stage is *Corticium vagum.*

The two organisms then, which in India, attack the ground nut and cowpea are, *Rhizoctonia solani*, Kühn, of which the fertile stage has yet to be discovered, and *Corticium vagum*, B. and C., which is the fertile stage of *R. violacea*: whereas jute and cotton are attacked only by *Rhizoctonia solani:* and there are at least four specialized forms of this species in India, which cannot be distinguished except by inoculation experiments. Each one of these four forms possesses microsclerotia; this differentiates them from the vegetative parts of *Corticium vagum*, which produces macrosclerotia.

Experiments in connexion with preventive measures indicate that carbolic powder applied to the soil in small quantities is effective. Naphthalene, though it kills the fungus, interferes, in the case of jute, with the germination of the seed, even when it is used in very small quantities. Probably the best means of combating the disease is by a careful rotation of crops, and it should be remembered in this connexion that the fungus is spread chiefly by means of the sclerotia that lie dormant in the soil.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

The Report of Mr. J. R. Jackson is as follows:—

The last month of the year 1912 began with fair supplies of drugs, and an active market, but with a good many changes in prices, mostly tending upwards, thereby, in many cases, limiting the demand. In the second week there was a distinct feeling that the Christmas holiday, and stock taking seasons were approaching, with the concurrent effect of diminished trade, a condition that will remain until the second week in the New Year when the drug auctions will be again resumed.

GINGER.

There has been very little business done in this article throughout the month. At the first auction on the 4th 265 bags of rough washed Cochin were offered and bought in, at 35*s.* for fair medium and small, and 32*s.* for wormy. No sales were effected at any of the subsequent auctions.

NUTMEGS AND MACE.

At the first sale on the 4th there was a steady demand for nutmegs, 145 packages of West Indian selling at the following rates; 66's at 6*d.*, 79's to 89's, 4¾*d.* to 5¼*d*, 91's to 102's, 4¾*d.*, to 5½*d.*, 105's to 115's, 4¾*d.* to 5¼*d.*, 117's to 127's, 5*d.*, and 144's to 153's, 4¾*d.* A week later the sales of West Indian nutmegs amounted to 148 packages at rates, varying very slightly from the preceding. At this auction some packages of Eastern were also offered and sold, 96's fetching 4½*d.* and 137's 4¾*d* ; limed sold at 5¼*d.* for 70's and 4¾*d.* for 95's. On the 18th, 88 packages of West Indian were offered and mostly sold, 66's to 76's fetching 5½*d.* to 6½*d.*, 81's to 94's, 5¼*d.* to 5½*d.*, 97's to 105's, 5*d.* and 135's to 142's, 4¾*d.* to 5*d.*; of mace the sales were as follows. On the 4th of the month, 44 packages of West Indian were brought forward, part of which sold at 2*s.* to 2*s* 3*d.*, and broken at 1*s.* 9*d.* to 1*s.* 10*d.* A week later, namely on the 11th, 34 packages were offered and sold at 2*s.* to 2*s* 3*d.* per lb.

SARSAPARILLA.

The only sale of this drug was held on the 12th of the month, when the offerings amounted to 21 bales of grey Jamaica and 5 of native Jamaica. The whole of the former was disposed of, 1*s.* 9*d.* to 1*s* 10*d.* being paid for fair slightly rough, and 1*s* 8*d.* for part rough. The five bales of native Jamaica were all bought in at from 9*d.* to 1*s.* 2*d.* per lb for inferior pale to fair bright red.

CASSIA FISTULA, KOLA AND TAMARINDS.

It was reported at the beginning of the month that the new crop of East Indian Cassia Fistula was both plentiful and good; at the drug auction on the 12th of the month, the offerings amounted to 52 packages, only 30 of these found buyers at from 18*s.* to 20*s.* per cwt. for lean Java. A firm trade has been done in kola which was represented at auction on the 12th by 21 bags which were all sold; 14 bags of fair dried West Indian realized 5*d.* per lb., slightly mouldy, 4½*d.* and mouldy, 3¾*d.* A further bag of bright West Indian halves, fetched 4¾*d.* per lb. and pickings 1½*d.* Five bags of small Ceylon quarters were also sold at 4½*d.* per lb. In the early part of the month, West India tamarinds were represented by 30 packages, four of which were sold at 12*s.* 6*d.* per cwt.

With reference to the increased use of vanillin, in place of the true Vanilla pod, it may be of interest to note that the makers of the artificial product are said to be considering, in consequence of the increasing cost of eugenol, the utilization of phenol in the preparation of vanillin. A warning has been given to those who use the artificial product for food flavouring, to satisfy themselves as to its source.

MARKET REPORTS.

London.—The West India Committee Circular, January 14, 1913; Messrs. E. A. de Pass & Co., January 3, 1913.

Arrowroot—3½*d.* to 5*d.*
Balata—Sheet, 3/7 ; block, 2/5 per lb.
Beeswax—£7 10*s.* to £7 12*s.* 6*d.*
Cacao—Trinidad, 69/- to 80/- per cwt. ; Grenada, 61/- to 68/-; Jamaica, 58/ to 66/-.
Coffee—Jamaica, 72/- to 83/6.
Copra—West Indian, £28 to £28 5*s.* per ton.
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Lime Juice—Raw, 8*d.* to 1/2; concentrated, £18 7*s.* 6*d.* £18 15*s.*; otto of limes (hand-pressed), 7/7½.
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Peas, Split—$5·75 to $6·00 per bag.
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Sugar—American crushed, no quotations.

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Arrowroot—$6·00 to $8·00 per 100 lb.
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Coco-nuts—$24·00.
Hay—$1·50 to $1·80 per 100 lb.
Manures—Nitrate of soda, $75·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $80·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$6·00 per 100 lb.
Peas, Split—$6·40 per bag of 210 lb.; Canada, $3·00 to $4·90 per bag of 120 lb.
Potatoes—Nova Scotia, $1·70 to $3·00 per 160 lb.
Rice—Ballam, $5·10 to $5·60 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $4·75 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, January 18, 1913; Messrs. Sandbach, Parker & Co., January 17, 1913.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	——	——
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	72c. per lb.	——
Cacao—Native	18c. per lb.	19c. per lb.
Cassava—	80c.	——
Cassava Starch—	$6·50	——
Coco-nuts—	$16 to $20 per M.	$10 to $16 per M.
Coffee—Creole	17c. per lb.	19c. per lb.
Jamaica and Rio	20c. per lb.	20½c. per lb.
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Dhal—	$3·75 to $3·90 per bag of 168 lb.	$4·75 to $5·00 per bag of 168 lb.
Green Dhal	$5·00	——
Eddoes—	96c.	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	9c. to 10c. per lb.	7c. per lb.
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Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	$2·75 to $3·00	$3·00
Lisbon	——	——
Potatoes-Sweet, B'bados	$1·32 per bag	——
Rice—Ballam	No quotation	——
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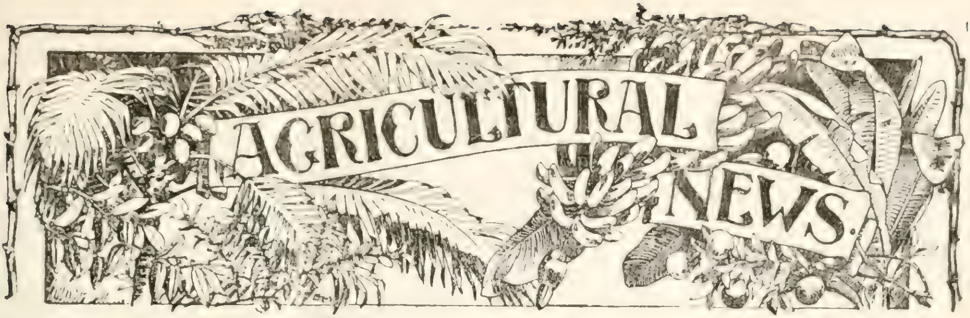

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A Tropical University.

IN *The Times* of January 23 there appears a special article under the heading 'The Case for a Tropical University' advancing strong reasons for the creation of a University of Tropical Agriculture and pointing to the West Indies as the most suitable locality for the suggested university. This article is reproduced on another page of the present issue of the *Agricultural News*, and should be read in connexion with what follows here.

The publication of Mr. Norman Lamont's book called *Problems of the Antilles* is the immediate prompting cause of the article just mentioned, which is a powerful appeal for consideration of the subject: and it is evident from the many references to the matter in agricultural journals, in deliberations on tropical agriculture, and in the proceedings of the recent West Indian Agricultural Conference, that the question is now ripe for extended discussion with a view to definite action.

The subject has for some time been a matter of serious consideration and some correspondence on the part of the Imperial Department of Agriculture, and the time has now arrived when it appears necessary and desirable to ventilate the question as freely as possible, and this in view of the strong advocacy of *The Times* and the definite allusion to the West Indies as affording a good locality as regards ease of access and material for teaching.

The aspects of the suggestion for a University of Tropical Agriculture are many, and it is to be expected that support will be accorded to the proposals by those who have advocated various sides of the question which may well be embraced within the bounds of a copious scheme. Foremost amongst the ideas which it may be expected to include is that of the Agricultural College, then follow ideas pertaining to agricultural investigations, first of a utilitarian and then of an abstract kind, and finally the training of experts to an extent beyond the generally accepted scope of the Agricultural College—experts who may deal with problems of Agricultural Chemistry, Entomology, Mycology, and many allied branches of study.

The need for agricultural colleges has been pressed upon the attention of those engaged in tropical agriculture for over fifty years. In this advocacy the several West Indian Colonies have been referred to, or have taken an active part, but so far as the British West Indies are concerned nothing of a definite character has yet emerged; though it is to be observed that in recent years much good work has been done in introducing the teaching of science subjects with an agricultural bearing into the secondary schools in all the colonies and thus preparing the way for the higher scheme which now demands recognition.

In most of the discussions that have already taken place in this connexion, ideas have tended to narrow themselves down to the training of young men for particular tropical colonies and even for particular industries; as a result a difficulty has arisen and, it is believed, has arrested the development of more than one promising scheme. The difficulty lies in the fact that if students are to be trained chiefly for local employment it is soon realized that the maintenance of an efficient college involves either the existence of a larger number of students than can find employment locally; or, if the number of students is to be sufficiently low to satisfy local needs, then the teaching staff and educational equipment necessary for adequate instruction become disproportionately large and costly for the results obtained.

When, however, consideration is given to the training of students for the whole range of the West Indies, and when it may be anticipated that an institution of good repute may attract students from Central or South America as well as many turning their attention to West Africa and other tropical colonies, it may seem that by expansion, one of the main sources of difficulty besetting an agricultural college will be removed.

The outlook admits of further enlargement in that a growing need is felt in our British Universities for the means of completing the training of those students whose interests are centred on tropical problems; and as Tropical Schools of Medicine are now recognized as essential, so it is felt that Tropical Schools of Agriculture are necessary. In agriculture, however, it is not possible, as in medicine, to bring cases for study to the Mother Country; if anything effective is to be done it is clear that the Tropical School of Agriculture must be located in the tropics and, as is pointed out in *The Times* article, the West Indies afford an admirable locality for such a purpose.

In this connexion it is to be recognized that the students of our Universities who are desiring to equip themselves for work as experts in matters pertaining to tropical agriculture are now seriously handicapped by having no tropical station in which they can complete their training; and excellent as is, no doubt, the great store of tropical material existing and available for teaching purposes in our museums and universities, it can never have the force and efficiency that come with acquaintance with things on the spot existing as matters of real, live concern to the place in which they are seen. This applies to most of the phases of such science as Zoology including Entomology, Botany, Mycology, Chemistry—the tropical aspects of which can only be adequately appreciated in the surroundings where tropical conditions obtain.

Again, those who are engaged in advising in matters pertaining to tropical agriculture are met constantly and with increasing force by the circumstance that our knowledge of facts is painfully limited; information is continually sought, which has lacked the opportunity to be found; inferences drawn from the conditions in temperate countries are often misleading; and so the teaching of advisers in tropical agriculture is often merely tentative and may be wrong. It is increasingly evident that stations for experiment and research are urgently needed. In recent years, certainly, there has been a growing tendency to increase the facilities for experiment, and good results have been obtained; these developments have been the concern of several colonies and of necessity have had relation to local problems and requirements. These efforts, also of necessity, have had regard to problems of a utilitarian character, and have met their chief support in colonial communities from the belief that they are likely to prove remunerative.

Workers in the field of tropical agricultural knowledge are asking with increasing insistence for information of a more abstract character—are asking for abstract research. It is improbable that this will be provided by colonial communities: it lies beyond their immediate needs, powers and resources, and for its attainment renders necessary an appeal to a wider field. Utilitarianism will largely limit the activities of individual communities, so that special efforts are required to extend the outlook, and to include those in the home country and those in the colonies who are interested in the general development of tropical affairs. The utilitarian aspects of the work of the experiment stations may be regarded as a province of the various active local departments of agriculture, while the prosecution of research may well become the function of the Tropical University.

It would appear that careful consideration and an appreciation of the need of expanding the idea beyond the limited range of an agricultural college are the circumstances that have led *The Times* to refer to the need for a Tropical University, and this is the direction in which the greatest usefulness as well as the greatest chances of success are to be sought.

The question at once arises: If this is the need, how is it to be met and how is provision to be made for it? Having regard to its wide aspect, it appears to go beyond the scope of any particular colony, so that it would appear reasonable to make the appeal for support to the large public interested in Tropical Agriculture and particularly to those who are concerned with West Indian affairs or with those industries which find exposition in the West Indies, so that knowledge respecting them may be increased not only for the benefit of the West Indies but in regard to those industries wherever carried on. Appeal may also be made to those responsible for the training of, and those undertaking the employment of, men required for the carrying on of the multitudinous tropical industries, as well as to those responsible for the training and for the employment of the expert scientific advisers mentioned already. This appeal should no doubt in the first instance be addressed to the large public interested in these affairs: and when it is assured that a real public interest and desire for action with offers of support have been made evident, then appeal may be made for Government recognition and assistance.

The importance of the subject, the necessity of the object, and the fact that the proposals for a Tropical Agricultural University are now being so definitely discussed, are all causing the matter to become a concern of the Imperial Department of Agriculture; and incidentally the publications of this department will now be made specially a means of assisting the preliminaries of establishment, and of disseminating the information as to methods and progress, that will be needed by those interested actively in the foundation of such a University.

SUGAR TRADE OF THE UNITED KINGDOM, 1912.

The following figures giving the imports and exports of sugar, expressed as the nearest ton, into and from the United Kingdom in 1912, are taken from the *International Sugar Journal* for January 1913. For purposes of comparison the quantities of 1911, taken from the same source, are also included:—

IMPORTS.

	1912.		1911.	
Unrefined Sugars	Quantity, tons.	Value, £.	Quantity, tons.	Value, £.
Germany	178,687	1,885,408	391,947	4,287,396
Java	182,512	2,629,225	166,866	2,687,269
Austria-Hungary	111,927	1,473,038	62,225	756,960
British India	24,344	325,380	65,399	1,114,382
Mauritius	28,922	374,931	55,548	649,941
British W.I. Islands, British Guiana and British Honduras	41,237	676,893	54,330	750,806
Netherlands	28,416	307,890	30,887	466,438
Hayti and San Domingo	42,536	644,293	27,277	296,273
Peru	62,194	809,927	27,176	293,874
Belgium	24,814	256,912	21,331	282,964
Brazil	11,944	159,129	14,663	137,612
Mexico	20,904	292,073	8,139	102,260
Dutch Guiana	2,541	43,051	6,429	89,908
Cuba	86,643	1,203,890	3,848	29,611
Philippine Islands	4,487	61,110	3,645	34,293
Russia	...	.. ..	1,741	21,686
Straits Settlements	452	5,453	1,180	15,689
France	4,062	50,640	251	2,603
Other Countries	49,419	566,418	18,201	213,430
Total Raw Sugars	906,144	11,765,661	961,084	12,233,395

	1912.		1911.	
Refined Sugars	Quantity, tons.	Value, £.	Quantity, tons.	Value, £.
Germany	269,187	4,305,898	366,442	5,311,318
Austria-Hungary	117,330	1,943,175	186,021	2,721,855
Holland	180,195	3,108,028	144,765	2,402,092
Russia	95,068	1,532,378	109,727	1,679,889
Belgium	69,716	1,112,558	60,015	1,022,049
France	15,334	235,393	5,822	93,411
Other Countries	66,931	1,164,620	64,434	1,122,830
Total Refined Sugars	813,762	13,402,050	937,226	14,353,444
Molasses	195,624	845,656	157,344	678,978
Total Imports	1,915,530	26,013,367	2,055,654	27,265,817

EXPORTS.

	1912.		1911.	
British Refined	Quantity, tons.	Value, £.	Quantity, tons.	Value, £.
Canada	6,454	122,192	8,665	130,868
Denmark	4,254	61,938	4,100	52,504
Netherlands	3,683	57,371	2,957	43,822
Italy	694	9,831	1,105	13,349
Portugal, Azores and Madeira	1,460	21,940	1,124	15 854
Other Countries	13,214	251,898	10,624	183,488
	29,759	525,170	28,576	439,885

A summary of the details given concerning the exports of foreign and colonial sugars may be presented as follows: The total of such exports during 1912 was 43,348 tons, value £716,670, as compared with 37,163 tons, value £552,290, in 1911.

FRUITS AND FRUIT TREES.

PRESERVING FRUITS FOR EXHIBITS.

The following suggestions are made as the result of incomplete experiments and with the consciousness that this is only in the nature of a preliminary report, and barring details will be found nevertheless to furnish a basis for further experiments. Considerable success has been attained along these lines in preserving specimens of fruits, leaves and twigs for the purpose of showing insect pests *in situ*, with a natural condition of the plant, and it seems certain that the plan can be perfected.

The following is a brief outline for tentative working basis for more experiment as to length of time for treating and for proportions, all of which must vary according to the structure of the tissues of the plant specimen, or the fruit and the amount of juices or sap present.

(1) Immerse specimen in solution of copper sulphate, 1 part to 500 to 1,000 pure water, about three or four days.

(2) Siphon off fluid, wash carefully by adding water through tube reaching to bottom of the receptacle; siphon off the water and add in same manner more copper sulphate solution, double strength used first; let stand five to ten days. If plant tissues are soft or pulpy, or rich in sugar, etc , add to this solution one-half to one per cent. glycerine.

(3) Remove fluid in same manner and let stand in pure water twenty-four hours.

(4) Remove water and add solution of 40 per cent. formalin, 1 to 500, plus 1 or 2 per cent. glycerine and 3 to 10 per cent. alcohol, and let stand one to three weeks.

(5) Wash carefully as before.

(6) Add final preserving fluid. For most specimens solution of sulphurous acid 1 to 500 is best, to which may be added if necessary glycerine and alcohol as with the formalin solution.

Instead of sulphurous acid, it may be best for certain specimens to use solution of formalin for final preservative, or in some cases boracic acid, or even salicylic acid, while in a few cases more or less alcohol alone or in combination is required.

This final solution needs to be changed from time to time, whenever the growth of fungus forms a complete, firm, mouldy scum on the surface of the fluid.

A small air space is necessary in any sealed or glass-stoppered bottle to allow for expansion of fluid at different temperatures. (The more succulent the specimen the weaker should be the solutions of copper sulphate.) (The *Monthly Bulletin* of State Commission of Horticulture, December 1912.)

THE ARTIFICIAL RIPENING OF BITTER FRUITS.

Professor Francis Lloyd, of McGill, related, in his address to that university on October 8, 1912, how, and the reason why, astringency can be removed from bitter fruits in fifteen hours by subjecting them to the action of carbon dioxide under pressure.

The idea is one that immediately attracts the interest of both chemist and botanist. It appeals with equal force to the instincts of the practical horticulturist and the salesman. And moreover, the two kinds of fruit with which these investigations have been chiefly concerned—the date and persimmon—grow naturally in the tropics and sub-tropics, and a question arises at once as to whether Professor Lloyd's treatment could not be extended, for example, in the matter of improving the flavour of the coarser varieties of West Indian mangoes and the various wild fruits whose utilization as food is limited largely by reason of their excessive bitterness.

Professor Lloyd's address is published in *Science* for December 27, 1912, and from that source the following information has been abstracted.

Astringency in fruits and other plant parts is due to the presence of tannin in some form, very frequently tannic acid. One of the most peculiar properties of tannin is its power to enter into combination with many other substances such as proteins, gelatins, mucilages and the like, to form complexes (or compounds in a loose sense) which have in common the peculiar property of resisting agents of decay. The usefulness of tannin in the arts depends on this property. A vivid impression of this peculiarity is afforded by biting an astringent fruit like the persimmon or an unripe banana. The tannin in these will quickly attack and combine with the skin of the mouth, causing what may be accurately and simply described as a rapid manufacture of a thin coating of leather over the mucous membranes.

Another peculiarity of these tannin-complexes, and one that more directly concerns the subject of this article, is the fact that tannins are held more tenaciously by coagulable substances, such as the white of egg, when they are in a state of coagulation than when not. It has been shown that tannin in its relation with a coagulable substance in the persimmon, analogous to the white of egg, acts in the same way. This is known as the principle of colloidal protection.

In considering the case of astringent fruits like the date and persimmons, which when ripe appear to be entirely devoid of the astringent principle, tannin, it should be remembered that such fruits contain quite as much tannin when non astringent as before. The tannin is simply protected.

The Arabs have for many centuries practised the art of ripening dates artificially. This consists in exposing the bunches of unripe fruit to the vapours of vinegar, of which the active agent appears to be the acetic acid. The same effect can be produced by other chemicals and by supra-normal temperatures. The cause of the change in some instances is oxidation which renders the tannin tasteless. In the case of the action of acid vapour on the date, evidence points conclusively to the non astringency being due to the formation of a colloidal protector, and not to the destruction of the tannin.

As regards the artificial ripening of persimmons in Japan, a custom is followed by which the unripe fruit is stored in air-tight tubs in which the alcoholic beverage saké has been kept. The ripening may be due to the effect of alcohol or a slight amount of acetic acid. Experiments indicate that the alcohol stimulates increased respiration, and that the carbonic acid gas produced is the ultimate cause of the change.

This has led to the question as to whether carbon dioxide, under pressure, might not bring about a similar change with greater rapidity. Fruit was placed in a specially devised but simple apparatus composed of a piece of 4-inch gas pipe suitably capped and supplied with a pressure gauge and with the outlets guarded by gas cocks. The effect on the fruit of different pressures of carbon dioxide was tried, and it was found that fruit exposed to a pressure of 15 ℔. to the square inch become non-astringent in about thirty-six hours, whilst that subjected to 45 ℔. pressure became non astringent in about fifteen hours.

To explain this change it is necessary to return to the principle of colloidal protection. Tannin occurs in the date fruit in little sacs. Along with the tannin in these sacs is a mucilaginous substance which becomes coagulated in the presence of acids and thus forms a colloidal protection, holding in the tannin so that it may not escape except at a very slow rate—too slowly for it to be detected even by the delicate membranes of the mouth. Although a colloid, tannin is not a coagulable one, like gum and mucilage; but, as already pointed out, it possesses those peculiar properties of combining loosely with coagulable substances and of being held tenaciously by them when coagulated. In a word, the tannin masses of the *ripe* fruit are a sort of vegetable leather, which like ordinary leather gives up its tannin only very slowly. The action of the carbonic acid is of course to coagulate the mucilaginous substance, and this effect may be compared with the recent discovery that carbon dioxide can cause the coagulation of the latex of rubber trees.

WEEDS AND MAIZE CULTIVATION.

A bulletin (No. 257) was issued toward the end of last year, by the Bureau of Plant Industry of the United States Department of Agriculture, which gives the results of investigations designed to discover how far the beneficial effects that follow cultivation in maize fields is due to the removal of weeds. In the experiments, plots cultivated in the ordinary way were compared with those in which the weeds were simply removed with a sharp hoe, with as little disturbance of the soil as possible. Under the conditions of the experiments, almost as good results were obtained by the simple removal of the weeds as by ordinary cultivation; in fact, in some cases, the latter seemed to 'cultivate' the weeds as much as the crop, for at the end of the season the simply-weeded plots were cleaner than the cultivated. More work is required before the results can be accepted in a general way. For the present, it is sufficient to detail the conclusions as they are expressed in a summary at the end of the bulletin:—

A number of tests made at several agricultural experiment stations seem to indicate that it is the weed factor that makes the cultivation of corn necessary, or, stating the proposition conversely, that cultivation is not beneficial to the corn plant except in so far as removing the weeds is concerned.

The subject of weed control is recognized as a fundamental one in tillage philosophy. It was therefore determined to carry on, over a wide range of climatic and soil conditions, a large number of tests of the relative yields of corn produced by supposedly optimum cultivation as compared with mere weed elimination.

The experiments were made by having two plots or sets of plots, one of which received no cultivation after planting, the weeds being kept down by a horizontal stroke of a sharp hoe at the surface of the soil, particular care being taken not to disturb the soil or to form a soil mulch; the other set of plots received the usual cultivation.

This work was carried on by the Department of Agriculture for six years (1906 to 1911) in co-operation with several State agricultural experiment stations and with farmers, many of whom were graduates of agricultural colleges. The results of 125 experiments are recorded in this bulletin, including the early experiment-station tests. The seven years' work in Utah is given separate discussion. Of the 125 experiments 124 record grain yields and fifty-five give fodder yields.

A general average of all of these experiments shows that the weeded plots produced 95·1 per cent. as much fodder and 99·108 per cent. as much grain as the cultivated ones. If there was any difference between either set of plots in regard to thoroughness in keeping down weeds it was in favour of the cultivated plots.

Although it remains to be demonstrated how far this principle may be applied in any particular section, as a general average for all the regions in which this work was done, it may be concluded that the proposition just stated is substantially true. If this be accepted, weed control becomes the principal object of cultivation.

Weeds may be attacked in two ways: (1) by the use of tillage implements, the primary purpose of which is their eradication; and (2) by adopting cropping systems having that object in view.

COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date January 27, with reference to the sales of West Indian Sea Island cotton:—

Since our last report a good business has been done in West Indian Sea Island cotton and prices remain very firm. About 250 Bales have been sold, including Nevis and Montserrat (old and new crop) 17*d.* to 18*d.*, St. Kitts 17*d.* to 19*d.*, with a few superfine lots at 20*d.* and Barbados at 18½*d.*

Owing to the poor character of the crop, Carolina Sea Islands are pressed for sale and extra fine graded cotton has been sold at 15¾*d.* and some graded crop lots are offering at 18*d.* to 18½*d.*, West Indians being preferred. We understand that many Carolina planters are intending to grow Upland cotton in place of Sea Island, owing to the poor yield of the latter and the competition of West Indian.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending January 25, is as follows:—

There has been a moderate demand this week for Fully Fine at 26c., Extra Fine off in preparation at 25c, Tinged Islands at 16c. There was also more inquiry for the Planters' crop lots, but as the bids were generally below the views of the Factors, the only sale reported is the crop 40 bales W. G. Hinson/Seaside at 36c. The buying has been principally on account of France.

We quote, viz.:—

Extra Fine	28c. to 29c.	= 16*d.* to 16½*d.*	c.i.f., & 5 per cent.
Fully Fine	26c. to 27c.	= 14¾*d.* to 15¼*d.*	,, ,, ,, ,,
Fine	26c.	= 14¾*d.*	,, ,, ,, ,,
Extra Fine off in preparation	25c.	= 14¼*d.*	,, ,, ,, ,,
Fully Fine off in preparation	23c.	= 13*d.*	,, ,, ,, ,,
Fine off in preparation	20c.	= 11½*d.*	,, ,, ,, ,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, to January 25, 1913, were *nil*, 196 bales, and 2,500 bales, respectively. Last year they were 3,325, 9,435 and 5,634 bales.

LANCASHIRE AND COTTON, 1912.

The following is taken from an article in the *Annual Trade Review*, issued as a supplement to the *Chamber of Commerce Journal*, January 1913:—

Considerable activity has prevailed in the staple industry of Lancashire during the past twelve months, and from the point of view of profits the year compares favourably with any previous period. The most satisfactory feature has been the plentiful supplies in the raw material, which to a large extent have been the means of bringing about a revival in trade. The advance in cotton prices during the year has been chiefly due to the increasing trade demand of spinners throughout the world. The year opened with manufacturers of cloth doing very well, and their strong position has been maintained. A decided improvement has occurred in the position of spinners and the year has been the best since 1908. The calico printing, dyeing and bleaching industries have been busy and many works have been working overtime.

On January 2, middling American cotton on the spot in Liverpool was at 5·10*d.* An upward movement at once showed itself and by the end of that month 5·57*d.* was reached. The hardening tendency continued during February, 5·88*d.* being registered on the last day of that month. There was not much alteration during March, but the high prices were still maintained, 6·20*d.* being the rate on the 30th. The upward movement continued, and on April 30, the figure was 6·41*d.* There was not much change during May, the figure at the close being 6·36*d.* A further upward movement occurred during June, the rate on the 29th being 6·60*d.* July brought still higher rates, the quotation on the 31st being 7·24*d.* A reaction occurred during August, 6·88*d* being the rate on the 10th, and the month closed with the figure at 6·40*d.* Towards the end of September a hardening tendency occurred and on the 30th 6·59*d.* was quoted. Rather easier rates transpired during October, and the month closed with the price at 6·36*d.* An upward movement took place during November, and that month closed at 7·06*d.*, and the quotation on December 13 was the same figure. The American crop for the season ending August 31 last, was of record dimensions, and amounted to 16,138,000 bales as compared with 12,120,000 bales for the previous season. A feature of the year has been the poor staple in the better qualities of the raw material. Egyptian cotton is also dearer than in January last. Fully Good Fair Brown opened at 8⅞*d.* On June 29 the figure was $10\frac{1}{16}$*d.* On September 30 the quotation was 9⅞*d.*, and on December 13, 10·05*d.* The Egyptian crop for the season amounted to 7,424,000 cantars against 7,573,000 cantars for the year before. With regard to future supplies, it is expected that the American crop for the current season will be 14,500,000 bales, whilst the official estimate of the Alexandria General Produce Association for the Egyptian crop is 7,750,000 cantars. All the cotton grown this season will be wanted, the requirements of spinners throughout the world having much increased during the last few years.

DEPARTMENTAL REPORTS

GRENADA: GENERAL ADMINISTRATION REPORT ON THE AGRICULTURAL DEPARTMENT, 1911-12.

Shortly before the publication of the Report for 1910-11, the Agricultural Department in Grenada had passed through a period of re-organization. This led to the Department being brought under the control of an Agricultural Board, composed of two official members and six members of the Grenada Agricultural and Commercial Society, the latter being appointed by the Governor for a term of two years. In the course of this development, the Department has made special provision for its affiliaton with the Imperial Department of Agriculture for the West Indies; and the Imperial Commissioner of Agriculture, when present in the Colony, officiates as a member of the Board.

As a result of this re-organization the various lines of activity have been very clearly defined, and the apportionment of work to the members of the staff seems to indicate, under existing conditions, a wise division of labour and responsibilities. As is stated in the Report, the present arrangements help to centralize the Department's work, afford elasticity, and allow for expansion in the future.

The publication under review is really comprised of five different reports arranged in the following manner: (1) a General Administration Report, by the Superintendent of Agriculture, reviewing the general working of the entire Department; (2) a report on the Laboratory of the Department; (3) a report on work in the Botanic Gardens;—both by the Superintendent of Agriculture, in his capacity as Officer-in-charge of these divisions; (4) a report on peasant instruction, by the Agricultural Instructor; and (5) a report on the Grenada Land Settlement Scheme, by the Land Officer.

This arrangement of matter serves to indicate shortly the general administration and lines of activity of the Department. The last four reports are treated as appendages to the General Administration Report.

As regards those matters of general administration referred to in the first part of the publication, reference should be made to the progressive policy in connexion with peasant instruction. The various prize-holdings schemes and the practical assistance rendered in the improvement of peasant agriculture together constitute one of the most important and characteristic features of the activities of the Department. The educational influence of the Department is further evinced by its support of the cadet system, which affords a training in agriculture to boys who have received a secondary school education (see *West Indian Bulletin*, Vols. XI, p. 443; XII, p. 20). It may be stated, without detracting from their specific usefulness for experiment and research, that the possession of a reference library and a well-equipped laboratory, should engender in the Colony a much wider appreciation of methods that are exact and deliberate.

Experiments that have so far been initiated by the Department can be classed as plot experiments and analytical work. A considerable amount of observation work on plant diseases has also been conducted. The plot experiments are of two kinds: (a) internal, or those carried out on Department land, and (b) external, or co-operative. An example of the former kind is the Morne Rouge experiment plot where trials are being made with limes, sugar-cane varieties and cotton; an illustration of the latter class is the extensive series of cacao manurial experiments in which 1-acre plots are situated on four different estates.

For an account of the various analytical investigations the reader is referred to the next report, on the Department Laboratory. Here results are recorded of water and soil analyses, and examinations of rum, sugar and rubber, but there seems to be a tendency to extend the functions of the laboratory in the direction of the chemical control of imports, and in the direction of legal work. Such work, though benefiting the general public, does not come strictly within the scope of an agricultural laboratory, and under existing conditions, is likely to limit its usefulness as regards agricultural research, unless adequate provision is made to enable it to fulfil its extended duties.

Following the report on the Laboratory is a detailed account of work carried out in the Botanic Gardens. Distinction is drawn between the ornamental or educational function of the Gardens, and their utilitarian or economic value. Several improvements of frontage and entrances have been carried out in the former connexion, whilst the extent of the economic work is made evident by the lists of fruit trees, seeds, cuttings and fodder that have been sold during the year under review. Agricultural activity in Grenada is generally considered as being confined to the production of cacao, and to a certain extent to nutmegs; but a perusal of these lists will show the diverse nature of the subsidiary cultivations which are rapidly being extended. Particular attention is being paid to the planting of Hevea rubber and coco-nuts, in Grenada, and to cotton and limes, in Carriacou. Efforts have been made to establish a cotton industry in Grenada. Success in this direction has been somewhat checked by the prevalence of a boll disease.

The last two reports, on Peasant Instruction and the Land Settlement Scheme, in Grenada, have already been referred to in a general manner, and in continuation, space will permit only a few concluding remarks on the progress attained in these different directions.

The reports of the judges on the cacao Prize-holdings Competition indicate that the work of the peasants has, on the whole, been disappointing. Various remedial suggestions are put forward, which if adopted, will check the growing tendency, on the part of some, to cease to compete.

The notes on peasant agriculture in the same report also merit attention.

The report on the Land Settlement Scheme provides a considerable amount of statistical information. The notes on the improvements of roads, on water-supply and experiment plots are concerned with important constructive details in the scheme; and of particular interest is the extension of a prize-holdings scheme to the Settlements, and the employment, in these areas, of crops of a diversified nature.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture, left Barbados on February 15, by the S.S. 'Ocamo', for the purpose of paying an official visit to Antigua.

The Secretary of State for the Colonies has approved of the appointment, as Assistant Master at the St. Kitts Grammar School, of Mr. J. A. Robotham, N.D.A., who has arrived to take up his duties, including those of Agricultural and Science Master.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

In consequence of the immediate importance of the subject, the editorial of this issue deals with the question of a Tropical University. This necessitates the omission of the second leading article on Water and Life promised in the last number. It will be given in the succeeding number (283) of the *Agricultural News*.

Page 51 contains tables showing the sugar trade of the United Kingdom during 1912.

On page 55, under the heading Departmental Reports, there appears a review of the General Administration Report of the Grenada Agricultural Department, 1911-12, which has been issued recently.

The Insect Notes will be found on page 58. They consist of a review of an account of insect pests in Barbados which appears in the recently issued report on the Local Department of Agriculture.

Page 59 should be consulted with reference to the subject of the editorial, as it contains a recent special article from *The Times* which presents the matter in a general way.

The Fungus Notes, on page 62, give accounts of inoculation experiments with cotton boll rot, and of a condition known as the pea disease of rubber trees.

The first of three articles on Wattle Bark is given on page 63. It is intended at present to publish two other articles treating of the same subject, in the succeeding issues of this journal.

The Trade of Grenada.

In the Grenada *Government Gazette*, for September 2, 1912, it is stated that the total value of all articles exported in 1911 was £264,640. This is a decrease of £27,120 as compared with the value in 1910, or a little over 9 per cent. There was no appreciable variation in the destination of the exports, the United Kingdom taking £171,115 (64 per cent.), United States £43,689 (16 per cent.), and France £36,893 (14 per cent.).

Cacao constitutes the bulk of the exports, its value being £223,104, or 84 per cent. of all exports. The shipments of nutmegs have increased from 8,488 cwt. to 9,087 cwt., an increase of 7 per cent. on the quantity for the previous year. Shipment of mace has shown a slight decline. The bulk of both of these products continues to be taken by the United Kingdom. Cotton (lint) exported in 1911 brought in £7,452; the revenue from this product in 1910 was £5,797. Most of the cotton is grown in the dependency of Carriacou, but efforts are being made to extend the cultivation in Grenada. (See p. 55 of this issue.) The coco-nut industry shows signs of rapid extension and there were increased exports of various other fruits, including kola-nuts.

Manures in Southern India.

An instructive account of the utilization of naturally occurring substances as manures is contained in Vol. III, Bulletin No. 65, of the publications of the Department of Agriculture, Madras. The first part of the account deals with the manures in detail under the headings of (a) Manures of Vegetable Origin, (b) Animal Manures, (c) Mineral Manures.

Under (a) reference is made to the successful employment, for green manuring, of *Tephrosia purpurea*, which has often received mention in the *Agricultural News*; pepper leaves; sunn hemp (*Crotalaria juncea*); and of water-weeds collected in the vicinity of Kolair lake. Castor, and ground nut oil cakes, as well as others, are commonly used throughout the Presidency. The ashes of plants or parts of plants are also employed as manures, among which may be mentioned ashes from cane trash, cotton stalk ash and ashes from paddy (rice) husks. Waste water from rice mills and indigo waste are also employed.

In regard to (b) reference is made to the large export trade of manures derived from bones and fish. Endeavours are being made to popularize these fertilizers and so prevent their export.

(c) The number of mineral manures available is very limited. Nitrate of potash occurs in certain places, and when purified is frequently employed by planters. There are extensive natural supplies of calcium carbonate, and a crude phosphate is also obtained in limited quantities.

In the second part of the account, a description is given of the application of these manures. Dry lands receive practically no manuring at present. Green manuring is chiefly employed in paddy cultivation. Oil cakes are used for sugar-cane, tea and coffee. The effect of the local superphosphate on paddy is stated to be very marked.

A New Method of Soil Analysis.

It has already been shown by Dumont in France that sandy particles extracted in the course of an ordinary mechanical analysis of the soil are coated with a layer of clay-humus, and in compact soils, where colloidal elements abound, the presence of these coatings may falsify analytical results. In the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for January 1912, an account is given of Dumont's ingenious method of breaking up these clay-humus coatings with oxalic acid and of his method of separating silt and clay by centrifugalization.

The operations may be briefly described as follows: (1) treatment of the fine earth with oxalic acid, determining at the same time the percentage of carbonates from the carbon dioxide evolved; (2) dissolution of the humus substances with ammonia, and separation of the sands by the ordinary method of sedimentation; (3) separation of silt and fine silt by centrifugalization, (1,000 revolutions per minute for a quarter of an hour); (4) coagulation of the clayey and colloidal elements by ammonium carbonate separated together from the liquid by centrifugalization; (5) determination of the humus by evaporation of the remaining liquid in which the ash is also determined by igniting the residue.

Apart from its extreme accuracy, a great advantage of the method described above lies in the fact that the entire analysis can be completed in half a day.

Nitrogen-fixing Bacteria in Leaves.

An abstract of a preliminary report of investigations by F. C. von Faber on bacteria in the leaves of Rubiaceae (a family of plants containing, among others, coffee, Ixora, Gardenia and Cinchona), is contained in the *Experiment Station Record*, Vol. XXVII, No. 3. It is stated that plants of this group bearing these bacteria may be detected by peculiar knotty thickenings of the leaves. Garden plants so affected are several species of Pavetta and *Psychotria bacteriophila*. Bacteria are found in the growing points and from there supposedly extend with the growth of the plant. The chief mode of infection however appears to be by means of the stomata in the young bud leaves, resulting in the formation of a characteristic bacterial tissue which manifests itself to the naked eye as knotty thickenings. Starch grains have been found in this tissue and are supposed to serve nutritive purposes for the bacteria. Already pure cultures have been obtained from *Pavetta indica* and *Psychotria bacteriophila*. They appear to be biological strains of the same species. The author states that experimental evidence has been obtained which supports his hypothesis that these bacteria are symbiotic nitrogen-fixing organisms.

It will be rembered that a few years ago Professor Bottomley discovered bacteria in the cortical cells of the tomato plant; and although they were not apparently pathogenic, it was never established that they were able to fix atmospheric nitrogen.

Agriculture in Southern Nigeria.

Excluding products of the oil palm, which is not systematically cultivated, the most important crops grown for export in Southern Nigeria are cacao, cotton, ground nut, benniseed (or sesame) and maize. Para rubber is being extensively cultivated in certain districts. This information is taken from *Colonial Reports*—Annual, No. 735, for Southern Nigeria (1911), in which statistics are also given showing the amount of cacao and cotton exported during the past five years. In 1907, 2,089,225 lb. of cacao valued at £47,840 was shipped. This has steadily increased until 1911, when 9,858,774 lb. of cacao were exported from the Protectorate, valued at £164,664. The quantity of cotton products exported has been subject to considerable fluctuation, but the average annual output for the last five years has been 28,810 cwt. of cotton lint valued at £79,808, and 3,207 tons of cotton seed, valued at £7,690.

Reference should be made to the tapping experiments on rubber trees; and in this connexion, as well as in the exploitation of cotton, palm oil, tanning materials and minerals, work conducted at the Imperial Institute has greatly aided in general development and progress.

A New Weed Exterminator.

Wild garlic (*Allium vinale*) has for many years been a serious pest in that belt of territory which extends from Maryland to Missouri. Besides having the usual competitive action of a perennating weed, the plant is harmful in that the bulbils on the stem frequently get intermixed with wheat grain and create an objectionable flavour in the flour. As a weed with fodder crops, this plant may have an effect in causing the tainting of milk.

Considerable attention, therefore, has been directed by the Botanical Department of the Indiana Experiment Station, towards methods for eradicating this noxious weed. A letter in *Science*, for January 3, 1913, states that remarkable results have been obtained by the use of orchard-heating oil as supplied by the Standard Oil Company. It was found that when the oil was distributed over the field in a fine spray by a sufficiently powerful spraying machine, practically all vegetation was killed, not only above ground but below ground as well. It destroyed the bulbs of the wild garlic below ground and the bulbils at the top of the stalks. One or two plants with very large horizontal rootstocks survived, since these required a rather larger dose of oil than was generally applied.

The application of the oil appeared to have no lasting effects on the soil; the new growth from seeds already present in the soil and from subsequently sown cereals possessed the usual vigour.

In considering the trial of this method in the West Indies for exterminating perennial weeds like Devil's grass (*Cynodon Dactylon*) and Nut grass (*Cyperus* sp.) the following questions arise: (1) Will the oil actually kill the hardy rhizomes and tubers of these weeds? (2) Does the oil possess any injurious effect regarding the physical and biological characters of the soil? And: (3) What would be the cost per acre?

INSECT NOTES.

REVIEW OF A REPORT ON INSECT PESTS IN BARBADOS.

The Report of the Local Department of Agriculture, Barbados, for the year ended March 31, 1912, has been issued as a Supplement to the *Official Gazette* for January 24, 1913. This report contains, among a large amount of other matter, an account of work done during the year in connexion with insect pests of plants, most of the information under this head being found in that portion signed by Mr. W. Nowell, Assistant Superintendent of the Local Department, where it is arranged under appropriate headings.

Under the headings Inspection of Imported Plants and Seeds, and Fumigation of Cotton Seed, there will be found brief records of the routine operations carried out in connexion with these lines of work. The only point of interest attaching to the paragraphs appearing under these heads is that a scale insect new to the West Indies is reported to have been discovered on cacao plants from St. Lucia. This insect is *Pseudaonidia* [Aspidiotus] *trilobitiformis*, Green, formerly recorded from Brazil, in the Western hemisphere, and from several Asiatic localities.

That portion of the report included under the head Fungi Parasitic on Scale Insects, presents an interesting account of the occurrence of the shield scale fungus (*Cephalosporium lecanii*), the red-headed fungus (*Sphaerostilbe coccophila*) and of two others which do not appear to have been satisfactorily identified up to the time of writing the report. The glassy star scale (*Vinsonia stellifera*) was attacked by a fungus probably belonging to the genus Aschersonia.

(In connexion with this account of parasitic fungi and scale insects it may be of interest to refer to the papers on this subject presented at the eighth West Indian Agricultural Conference held at Trinidad in January 1912 which appeared in the *West Indian Bulletin*, Vol. XII, that by Mr. J. R. Bovell, F.L.S., at p. 399, and that by Mr. F. W. South, B.A., at p. 403.)

The insect pests submitted to the Local Department with the request for advice as to the control measures to be employed have included scale insects on a variety of plants. The use of scale-destroying fungi and sprays has been recommended for the control of these.

The cacao thrips (*Heliothrips* [Physopus] *rubrocinctus*, Giard.) is recorded as having been sent in on leaves of grape vine, mango and croton; *Euthrips insularis*, Franklin, was reported on rose trees and bonavist; another species of Euthrips occurred on sweet potato, and *Heliothrips haemorrhoidalis*, Bouché, on fiddlewood (*Citharexylum quadrangulare*).

A mite which sometimes occurs in large numbers on the young internodes of sugar-cane while these are still enclosed in the sheathing leaf base has been under observation during the year under review. The attacks of the mite cause the surface of the cane and the edges of the leaf sheath to become covered with closely-set, minute blisters which are at first whitish, then red and later reddish brown in colour. (A description with figures of this mite has recently appeared in the *Bulletin of Entomological Research* for November 1912, where it is given the name *Tarsonemus spinipes*, Hirst. In this connexion it is stated that specimens of this mite were sent to England for study by Mr. J. R. Bovell twenty-two years ago. It is of fairly common occurrence in several West Indian islands.) Mention is made of the natural control of an attack of red spider on sweet potatoes by the action of the larvae and adults of a rove-beetle (Staphylinidae), as a result of which the red spider was reduced from a condition of extreme abundance to one of comparative scarcity, within a week.

An instance of complete natural control of the common Aphis on melons by lady-birds and hymenopterous parasites is also recorded

The discovery of the cotton leaf-blister mite in Barbados in February 1912 is also noted. This pest, which had been known for several years in other West Indian islands had not previously been found in Barbados. After the discovery was reported by the Entomologist on the Staff of the Imperial Department of Agriculture, the officers of the Local Department made a careful examination to determine the limits of the infestation, which was found to occupy a large proportion of the cotton-growing area of the island, the south eastern district being the only portion free from infestation. An area about two miles wide and six miles long, lying along the coast to the north of Bridgetown, was distinguished as being much more seriously infested than any other district. This is situated some two miles or more from the point of its first discovery, and it is stated that this section was probably fully infested in the season of 1910. This area probably includes the original point of infestation.

The method of the introduction is not known, but the hypothesis is put forward that the leaf-blister mite may have been brought to Barbados by birds. This is based on observation of the method of spread within the island, which points to birds as the agents most likely to cause distribution within the limits of a cotton field and from one field to another.

The investigations recorded in connexion with the study of the root borer of the sugar-cane (*Diaprepes abbreviatus*) and the brown hardback (*Phytalus smithi*) attacking sugar-cane in a limited district in Barbados, are of considerable interest.

The root borer has been known as a pest for several years, chiefly on one estate where the study recorded in the report under review was carried out. The chief points now presented in addition to those previously known (see *West Indian Bulletin*, Vol. IV, p. 37 and *Agricultural News*, Vol. X, p. 218) have to do with the length of time that the grubs can live without food, and with the discovery of the eggs in the field.

It has been found that, when the larvae are deprived of food by the digging of the cane stumps after the crop is reaped, they penetrate deeper into the soil and there construct an earthen cell in which they lie dormant for some time. While the length of time which may be occupied in this manner has not been determined, it has been found that after a period of three months they are still alive and capable of resuming feeding as opportunity offers.

The eggs have been found to be laid on the cane leaf near the tip, where this has been split by the action of the wind. The eggs are laid between two adjacent portions which are brought into contact and their surfaces securely stuck together by an adhesive substance deposited by the egg-laying female, the eggs being thus well protected.

The collection of the beetles is mentioned as likely to prove the most effectual means of reducing the numbers of this pest, and it is recorded that during one week over 9,600 were captured on this one estate, from their hiding places at the bases of the leaves of sugar-cane and corn and among the leaves of pigeon pea and other convenient plants.

The practice of early reaping of infected canes followed immediately by the removal of the cane stools, and a rotation of crops, are also recommended as control measures of value. The following is quoted: 'It is only when the root borer is present in some abundance that it can be regarded as a serious pest, and where it does become abundant it can undoubtedly be checked when the trouble is taken to do it. This involves some amount of deviation from estate routine but that should not be impossible. It is not by casual measures taken when it happens to be convenient, but by vigorous action at the right time that success can be obtained.'

The important discovery in connexion with the occurrence of the brown hardback (*Phytalus smithi*) is that of an abundant parasite which is here recorded. This insect is a black wasp, *Tiphia parallela*, Smith, of the family Scoliidae. Its discovery was announced locally before the publication of the report, and a note concerning it appeared in the *Agricultural News* (see Vol. XI, p. 234). The brown hardback is not a pest of consequence in Barbados, probably on account of the control exercised by *Tiphia parallela*; but in Mauritius where the beetle occurs without the parasite it has been a most serious pest of sugar cane (see *Agricultural News*, Vol. XI, p. 90).

It may be observed that the report from which the foregoing is taken is the second issued independently by the Local Department of Agriculture, Barbados, and is the first in which there appears an account of the scientific work of the Assistant Superintendent.

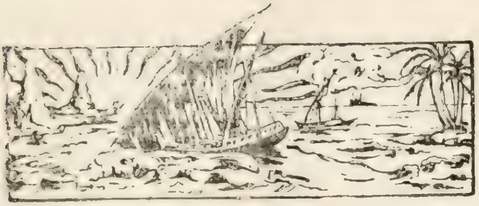
THE CASE FOR A TROPICAL UNIVERSITY.

The following appeared as a leading article in the *Times* of January 23, 1913; reference is made to it in the editorial of this issue of the *Agricultural News*, and it should be read in connexion with that editorial. It may be stated that Mr. Norman Lamont's *Problems of the Antilles* will receive review in the next number of the *Agricultural News*:—

The recent publication of a book by Mr. Norman Lamont on the "Problems of the Antilles" calls attention to a subject the importance of which has not yet received due recognition. It is the urgent necessity that exists for the methodical development of the resources of the vast and potentially wealthy tropical regions of the British Empire. When the population and the needs of this and of the world were much smaller than they are to-day, it was thought sufficient to gather such produce of tropical lands as Nature provided, and the habits of thought then acquired have outlasted the conditions of their origin. We are still apt to think of our tropical possessions as places where wealth can be found ready made and where it can be acquired without effort. That, of course, is no longer the case. The demand for various kinds of tropical produce is far too great to be met by anything short of systematic and scientific cultivation. Rubber is an example that will occur to everyone. It grows wild, and for a time demand could be met by using cheap native labour to collect it. Now it is found necessary to devote wide areas and a large amount of capital to its systematic cultivation. The same is true of many other tropical products; and would speedily become equally true of many more, whose uses have not yet been investigated on any adequate scale, if we had a rational system of tropical agriculture. By failing to establish such a system we are on one hand wasting an enormously valuable asset, and on the other hand stinting the expansion of industrial and social activity at home.

Now the greatest obstacle in the way of those who try to develop a tropical country is the want of men trained to deal with agricultural conditions in the tropics. It stands to reason that these conditions are widely different from those with which we are familiar in this climate. The most accomplished agriculturist in this country, if called to deal with tropical crops, would find himself obliged to begin again at the beginning and to start his education afresh. Not only the climate is different, but the plants, the soil, the insect pests, the diseases, the methods, and the conditions of labour. Hence we need, for the development of our huge tropical estate, men trained in tropical agriculture. Apart from a few exceptional persons, who by dint of great labour and costly experiment have arrived at some practical knowledge about a particular crop, such men do not exist. What is still worse, the means of training them do not exist. For want of such men a great source of wealth and employment remains sealed, a large amount of capital actually expended remains unproductive or is altogether lost, men are deterred from risking new capital, and from the standpoint of our national responsibility we miss by far the most powerful means of elevating the inhabitants of the territories we govern. It is in view of such considerations that Mr. Lamont advocates, as he and some others have done for the last ten years, the establishment of a University of Tropical Agriculture, a comprehensive technical school in which men may be taught everything that bears upon the cultivation of tropical soil. The matter has, we believe, attained the qualified success of receiving official consideration; but in the meantime great opportunities are being wasted, and there is even a danger that in the fierce competition of the present day some of them may not recur. Partly by State action and partly through private munificence we have established schools of tropical medicine which are making it possible for white men to live in health in regions where existence was precarious or almost impossible It seems a natural development of that policy to remove the economic obstacle to the success of a white population in our tropical possessions, by affording the means of education in the only pursuit which, so far as can be seen at present, offers any large prospect of employment there for capital and brains. Plenty of assistance from private sources would be forthcoming if a well-considered scheme of education in tropical agriculture were set on foot. The importance of scientific treatment of soils, plants, and plant diseases is more and more recognized in this country, where we have centuries of practical experience to guide us. The tropical agriculturist has no such guidance, and his dependence upon science is by so much the more complete.

A University of Tropical Agriculture ought obviously to be situated where the students will live and work in tropical conditions. Otherwise we should be in the position of teaching men to swim without water. It ought to be as centrally placed as possible, by which we mean that it ought to be as generally accessible as possible. It ought in particular to be easy of access from this country, because it is most important that its professors should keep in touch with all scientific effort at home. These considerations all point to the West Indies as the most suitable locality for the suggested university. There it would serve both Imperial and local purposes. Unlike many of our tropical possessions, the West India Islands contain a considerable population already educated and very restricted in its choice of educated pursuits. A tropical university would start many upon profitable employment at home, and probably send forth many more as pioneers and founders of an educated community in places where it does not now exist. It would not be too far away to attract really competent men to its teaching staff, nor would that staff incur the risk of becoming provincial or fossilized through want of easy communications with scientific centres here and in America.



GLEANINGS.

A notice in recent numbers of the *St. Lucia Gazette* states that the holdings entered for the Cacao Prize holdings Scheme in the Soufrière district of St. Lucia will be judged after the 23rd instant.

The plant distribution at the Dominica Botanic Station during last month amounted to a total of 4,998, including: limes 4,310, Para rubber 474, vanilla 100, shade trees 50, budded citrus 22, grafted mangoes 10, miscellaneous 32.

The plants distributed by the Antigua Agricultural Department during January last were as follows: sugar-cane 113,250, limes 1,836, coco-nuts 970, forest trees, 294, sweet potato cuttings 30,000. There were also included 2 ℔. and one bag of various seeds.

As in some other islands, rain has interfered with cotton-picking in Montserrat; although some estates have been able to get a very good second picking, in spite of the wet weather. A few of the estates will eventually harvest a good crop, but this is by no means the case with most of the small planters.

It is stated by the Curator of the Botanic Station, Antigua, that the presence of the flower-bud maggot of cotton was reported from the windward district of the island on December 29, and that it was noticed by the Agricultural Department on Januray 11. It is mentioned further that the attack is not severe.

A publication entitled *Fertilizers as an Aid to Profitable Farming* has been issued at the price of 3*d.* by Messrs. McGlashan, Gregory & Co., Printers, 20 Cullum St. and Bury St., E.C. It consists of two parts, dealing with the function and effects of the elements of plant food, and with the value of agricultural experiments.

A statement is contained in *The Board of Trade Journal* for December 26, 1912, which shows that the total quantity of cotton yarn spun, and of cotton woven goods produced, in British India and the Native States during the six months ended September 1910, 1911 and 1912, were respectively 122,043,576℔., 130,857,127℔., and 142,520,770℔.

A communication received from the Superintendent of Agriculture, Grenada, states that attempts made recently at the Botanic Gardens to propagate *Theobroma Cacao, T. pentagona* and *T. bicolor* by cuttings resulted in complete failure. Ordinary Forastero cacao was propagated, however, by circumposition—a method having the chief objection of expensiveness.

The *Cyprus Journal* for October 1912 contains the text of a Bill the object of which is to effect the gradual exclusion of goats from Cyprus. This was to have been considered in the last session of the Legislative Council. It would appear that the reason for the passing of such a Bill is the presence in the island of Malta fever, a disease that is transmitted by goats.

Information received from the Agricultural Superintendent, St. Kitts-Nevis, shows that the general prospects of the cane crop in the island have much improved: in the Basseterre district, conditions both of growth and freedom from disease are said to be in striking contrast to those of last season. Cotton-picking was nearly completed in January. In a few cases the returns are above the average, but in a general way damage has been done by the constant rains that have been received lately.

The *Chamber of Commerce Journal* for January 1913 states that information received from the Colonial Secretary, Singapore, shows that the export of rubber from Straits Settlements ports in November last was 1,828,400 ℔., as compared with 1,232,800 ℔. in October. The figures include transhipments from places such as Borneo, Java, Sumatra and the non Federated Malay States, as well as rubber produced actually in the Colony, but do not include rubber exports from the Federated Malay States.

The *Centralblatt für Bakteriologie*, 1911, p. 4, describes work with various disinfectants conducted with the object of ascertaining their power to free seeds from bacteria and fungi. Nearly all the disinfectants used failed to destroy the organisms producing disease, before a time had elapsed which was sufficient for the germination of the seeds. The results are opposed to the conclusions of other investigators, and it is considered that disinfection is often mistaken for a state (antisepsis) in which the organisms have not been killed, but merely prevented from growing.

Information received from the Superintendent of Agriculture, Barbados, shows that the area of growing cotton in the island during last calendar year was 3,971 acres of which 231 acres was so-called ratoon cotton, or cotton plants grown from the remains of plants of the former crop. The areas of cotton grown in Barbados in the four previous calendar years were as follows: 1908, 5,769 acres: 1909, 4,121 acres; 1910, 4,741 acres; 1911, 4,670 acres. The figures show a steady decline in the Barbados cotton industry which now gives signs of becoming rapid.

The Commissioner of Agriculture has received information from Sir Daniel Morris, K.C.M.G., that there is wanted immediately, by an English Firm in Central America, a capable assistant for plantation work, who should not be over thirty years of age. A sound experience in sugar, bananas, cacao and coco-nuts is essential, and a knowledge of Spanish will be a recommendation. The commencing salary will be £20 per month, with quarters. Application, with full particulars and testimonials, should be made to the Imperial Commissioner of Agriculture, Barbados.

STUDENTS' CORNER.

FEBRUARY.

Second Period.

Seasonal Notes.

The establishment of the sugar-cane crop requires the exercise of care in the choice of planting material, as well as the use of Bordeaux mixture. It must be remembered that proper attention to these matters (if favourable weather is experienced) is rewarded not only with a good stand of canes at the beginning of the crop season, but with evenly ripening plants at the end. Give an account of any experience with the juice from canes of uneven ripeness, that you may have had in sugar-making. State how Bordeaux mixture is usually made, and supply an account of a useful method for making it in very large quantities. Why is it not feasible to make up Bordeaux mixture in stock solutions, to be kept and diluted as they are wanted?

The qualities of the cane, its suitability to the district where it is grown, and the evenness of ripening are all matters that show themselves to be much greater in their respective effects where muscovado sugar is made than in the work of central factories. State the chief reason for this circumstance, and indicate its importance in comparing the economy of the central factory system for sugar-making with that of other, older methods. Give an account of the characteristics in ripening of some of the seedling sugar-canes with which you are best acquainted.

Useful observations on the root and rind diseases of sugar-cane can be well made at the time of harvesting. If there is opportunity, it is a good plan to watch, and make notes on, the canes coming into the carrier during a certain period of time each day, marking more particularly the amount of disease that is present and the parts of the estate, or district, from which the canes come. In this way, information will be obtained that may be valuable at a future time when a general consideration of the diseases is being made.

The editorial on Division of Labour which appeared in a recent issue of the *Agricultural News*, should be considered in relation to the notes on labour and co-operation already given in the Students' Corner. Division of Labour is also referred to in the current issue of the *Agricultural News*, in the review of the General Administration Report on the Agricultural Department, Grenada.

The student will appreciate the importance of discoveries of new sources of vegetable products. This matter has received considerable attention recently in the *Agricultural News*, and the information contained under the following references should be correlated: Vegetable Silks (Vol. XII, p. 29); New Sources of Paper (*ibid.* p. 30), [*cf.* Manila hemp, *ibid.* p. 21]; Vanillin (Vol. XII, p. 47).

The suitability of different crops for various places is not only determined by soil and climate, labour conditions, communication and external demand. The question as to whether their cultivation forms suitable employment for different classes of the community is equally important. Compare what has recently been said in the *Agricultural News* in regard to cacao for peasants in Dominica (see Vol. XII, p. 39); European vegetables in St. Lucia (Vol. XII, p. 19); peasant cultivation in Grenada, in the review of the report on the Agricultural Department of that Colony, in the current issue of this journal. Why are cotton and provision crops particularly suited to peasant cultivation?

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What is transpiration, and what are its uses?

(2) Describe the changes that take place in a growing cutting of a plant.

INTERMEDIATE QUESTIONS.

(1) Write a description of three seedling sugar-canes with which you are acquainted.

(2) Give an account of vegetable fibres that you have examined. Write a short account of the economic uses of fibres.

FINAL QUESTIONS.

(1) Explain the principle of 'double entry'. What are the differences between a profit, an asset, and a bad debt?

(2) Give characters of, and describe the sources of: (a) citric acid, (b) tannin, (c) sugar, (d) theobromine, (e) charcoal, (f) caoutchouc.

Development of the German Colonies, 1912.—The exportation of oil palm products from Togoland was very good during 1912, and the market price for palm oil and palm nuts was satisfactory. In spite of the best efforts, however, of both Government authorities and private persons, little progress was made in the cultivation of cotton.

Trade in the Cameroons was also good as a result of the high prices for palm oil and palm nuts, but the low prices of gums had a detrimental effect on the gum trade, especially in the southern districts. This is attributed to the unsound principle of the trust system, in virtue of which negroes are able to secure advance payments in respect of future deliveries. No improvement may be expected until the system of making payments in advance has been done away with. The new territory, which has been ceded by virtue of the Morocco Agreement, has up to the present not been opened up to commerce to any great extent. The French River Navigation Company ('Messageries Fluviales du Congo') will shortly pass into the hands of Germans, and will later be under German management. The cacao crop this year exceeded that of 1911, but the figures were not so good as in 1910.

Owing to the termination of railway construction in German South West Africa, there was a considerable falling off in the movement of trade in that Colony. Moreover, scarcity of capital was very marked, and was very much felt by those colonists who are dependent on credit for farming purposes. It is hoped, however, to establish a new Mortgage Bank, by means of which farmers will get State assistance for the development of agriculture.

Very considerable development is recorded in the case of German East Africa, but this is also due in great measure to railway construction. The export trade in oil, fruits, and hides was quite good, owing to the prevailing high prices, but on the other hand, the low price of wild rubber tended to check the collection of this product. It is anticipated that there will be a considerable development in this Colony in the cultivation of the sisal plant. Cotton cultivation on a large scale showed even less progress than formerly, but on the other hand, better results appear to have been obtained by individual European settlers and natives in a smaller way. A good future is predicted for the coffee plantations. (Summary of a Report of the Hamburg Chamber of Commerce; in *The Board of Trade Journal*, January 9, 1913.)

FUNGUS NOTES.

INOCULATION EXPERIMENTS WITH COTTON BOLL ROTS.

The following extract, taken from the *Experiment Station Record*, Vol. XXVII, No. 3, contains the results of recent work by Edgerton on the mode of infection of *Colletotrichum gossypii* which is the cause of anthracnose, and of *Bacterium malvacearum* which induces boll rot, in the cotton plant:—

The studies of Barre relating to flower infection by the fungus causing cotton anthracnose led the author to investigate the subject at some length. He claims that infection of cotton bolls following flower inoculation can take place in either of two ways. The system may grow saprophytically upon the dead flower parts and finally grow through and into the boll, or it may cause the disease by growing down through the pistil into the boll. The anthracnose probably follows both methods, while the cotton bacterium (*Bacterium malvacearum*) infects the bolls through the first method.

The author carried on a large number of inoculations in which he injected organisms suspended in water into the flowers, and determined the infection. More than half of the diseased bolls were attacked at the tip, while the percentage of infection along the lines of dehiscence was small. When the bolls are small they are readily infected, with anthracnose, though, so far as the observations of the author go, no one part of the boll is more susceptible than another. It is evident that the bolls may be infected through the flowers, but the author claims that this is not the usual method of infection.

PEA DISEASE OF RUBBER TREES.

A peculiar pathological condition of the stems of rubber trees is described in the *India Rubber Journal*, for December 7, 1912, where it is stated to occur in Java on Hevea and Ceara. The popular name for the ailment is 'pea disease'—a name employed to describe the pea-like structures characteristic of the disease. Unlike the knot of citrus trees, plant galls and similar morbid outgrowths, these pea-like swellings on the bark of rubber trees do not appear to be infectious; that is to say, no parasitic organism has been found associated with them, and therefore they must be considered as originating from some physiological disturbance.

It is fairly well known that trees which have been tapped badly, or in which the cambium has been penetrated during tapping operations, develop uneven surfaces. In some cases where the wood has been exposed, large protuberances occur, which may render tapping quite impossible for many months, and even for years. The burrs of the pea disease, however, arise in a more insidious way, and the remarkable feature of these structures is that many of them occur where there is no trace of any wound having been inflicted, or any fungus or insect having attacked the bark.

Each burr is quite woody in structure, is completely surrounded by cortex and—what is very typical—each of these little structures possesses a cambium of its own, and can therefore produce new wood until it becomes quite a large body. In other words each burr would appear to be a kind of adventitious woody bud.

The occurrence of these structures is said to cause a considerable amount of damage to the trees on which they grow. Tapping is interfered with owing to their spread and fusion, and the secretion of latex in their vicinity is considerably reduced. Pea disease also induces cracking of the bark. Damage of this nature is of sufficient importance to warrant prompt attention.

At present, the only remedy lies in removing the small burrs with a penknife. It should be borne in mind that careless tapping encourages these growths, any wounding of the cambium being almost certain to induce the condition.

Pea disease has been recorded on the bark of apple and pear trees in America and in Great Britain, as well as on rubber in the Tropics. It probably occurs in the West Indies. Any local observations on the subject, together with specimens, would be gladly received at the Head Office of this Department.

THE TAPPING OF RUBBER TREES.

The *India Rubber World* for January 1, 1913, thus abstracts a paper by R. Fyffe on this subject, read at the recent Rubber Conference in New York, held in connexion with the Third International Rubber Exhibition:—

The operation called tapping is one of extreme importance and the present methods are susceptible of marked improvement. This subject did not receive the consideration in the London Conference of 1911 that its importance warrants.

After the close of that exposition the author toured through Ceylon, the Federated Malay States and Java, studying the preparation of rubber and methods of tapping. Subsequently, he made many tapping experiments and reached the conclusion that the best method was a combination of excision and incision.

Excision alone he believes detrimental to the tree, as the coolies in their endeavour to get the maximum latex almost inevitably cut too deep, thus injuring the lactiferous tubes close to the cambium. These deep wounds heal slowly, retard the growth of the tree and give access to fungus. He does not consider incision alone practical, but advocates a shallow excision combined with incision made by a fine push pricker. Where the points of the pricker are fine they may penetrate the cambium without injury. He does not advocate broad blunt teeth. He got satisfactory results from a push pricker with gramaphone needles filed flat on two sides and fitted $\frac{1}{3}$-inch apart into a small block of wood. He followed the half herring-bone system on about one-third of the tree's circumference.

Energy for Carbon Assimilation.—From the recent measurements of Brown and Escombe (*Proceedings of the Royal Society*, 1905, 76 B) of the actual energy absorbed by the green leaf during the period of assimilation, it appears that under the most favourable conditions nearly 100 per cent. of the total light-energy absorbed is utilized in bringing about chemical change. The leaf seems, in fact, to be an almost perfect photochemical machine; moreover, the photochemical change produced in the leaf differs from all others, not only as regards the enormous amount of energy actually absorbed, but in the fact that this energy is mainly taken up from a portion of the spectrum, which is usually inactive photochemically: in other words, chlorophyll has properties which distinguish it from most other colouring matters. (From a paper in *Science Progress*, October 1912.)

WATTLE BARK.

I.

In view of the fact that the plants yielding wattle bark, which gives an extract rich in tannin that is used largely in the leather industry, may possibly become eventually of practical interest in the West Indies, it has been thought useful to present, in this and the next two numbers of the *Agricultural News*, a few notes on these plants, dealing particularly with their nature, habitat, cultivation, yield and exploitation.

ORIGIN. A recent publication (*Agric. Journ. Union of South Africa*, IV, 5, 667) states that, of the acacias tried in South Africa, only the following were found to contain sufficient tannin to make them of economic importance: black wattle (*Acacia decurrens*, var. *mollis*), green wattle (*A. decurrens*, var. *normalis*, golden wattle (*A. pycnantha*). In stating this, it may be mentioned that the wattle barks are dealt with in Baron von Müllers *Select Extra-Tropical Plants.*

The name wattle is derived from the Anglo-Saxon *watel* or *watul*, meaning a hurdle. The wattles of England are the twigs of the osier (*Salix viminalis*).

HABITAT OF WATTLE PLANTS. An article in the *Journ. Agric. Dept. Victoria*, X, 11, 684 (November 1912), gives the habitat of *A. decurrens* as New South Wales, Victoria and Queensland, and of *A. pycnantha* as Victoria, New South Wales and South Australia; this fact regarding the latter plant indicates that it should do well in subtropical or warm-temperate regions. The plants have been introduced into India, among other countries, especially in the Nilgiri Hills (in 1840) according to Sir George Watt (*Commercial Products of India*, p. 2), where the climate is warm-temperate; here, the two species mentioned are partly cultivated and partly wild (*Manual of Indian Timbers*, Gamble, p. 291). The story of the introduction of these Australian plants into Natal is told shortly in *Agric. Journ Union of South Africa*, IV, 5, 666 (November 1912), the first black wattle seeds having been planted there in 1864. As is shown in *Agric. Journ. Cape of Good Hope*, XXV, 3, 277, the black wattle has been grown successfully in Cape Colony, where the rainfall is sufficient or there is irrigation. New Zealand is another country where the black wattle has been tried on an extensive scale; in 1904, there were more than 4,500 acres of artificial plantations of the tree in this dominion (*Queensland Agric. Journ.* XV, 5, 730). The plants have also been introduced into Ceylon. In the British East Africa Protectorate and German East Africa the cultivation of the wattles has passed the experimental stage, and is successful.

SEEDS. Watt, in the *Dictionary of Economic Products of India*, states that 1 lb. of the seeds of the black wattle contains 30,000 to 50,000 grains, and that (according to Müller) this quantity could be obtained in Melbourne at a cost of about five shillings. Messrs. Dammann & Co., of San Giovanni a Teduccio, near Naples, advertise seeds of *A. decurrens* at 5*d.* per oz. or 3*s.* 9*d.* per lb., and of *A. pycnantha* at 4*d.* per oz. or 3*s.* per lb. A description (*Journ. Dept. Agric. Victoria*, X, 11, 688) of germination experiments with air-dried seeds of various acacias shows that those of *A. decurrens* maintain their vitality for a long time: 63 per cent. germinated in a sample that had been kept for seventeen years. As the seeds, like those of many leguminous plants, are very hard, they are often softened before they are sown, preferably by dropping them into water that has just been boiled and allowing them to remain until it has cooled; in this case the seeds must be planted at once. Other methods suggested in the journal just mentioned are soaking in concentrated sulphuric acid for one to six hours and then washing well in water and limewater, and filing the seed. It is recommended by the same authority that, in any case, the seeds should be tested by soaking a few of them in water, for two or three days, and noting the proportion that swell. If only about 10 per cent. of them remain hard, it is not worth while to treat them before sowing, as a comparatively small proportion will fail to germinate because they have not been able to absorb water.

It may be mentioned that the seeds of *A. pycnantha* have a special interest on account of an investigation (*Proc. Linn. Soc. New South Wales*, XXXIII, 4, 801) which showed that 45 per cent. of the nitrogen in them is non-proteid nitrogen, and led the author to conclude that the importance of non-proteid nitrogen to plants is not properly recognized.

SOWING THE SEED. The following hints are taken from the journal published in Victoria, mentioned above:—

'Sowing seeds broadcast on ploughed or burnt land involves a considerable waste of seed, and is not always satisfactory in its results. Planting seedlings or individual seeds appears at first a more expensive and troublesome way of establishing a plantation, but is in the long run more satisfactory in its results, and enables the plants to be spaced out the proper distance apart without any subsequent thinning being necessary. If, however, the seedlings are grown in masses in trays, they are apt to suffer when planted owing to the disturbance of their roots. On the other hand, growing singly in pots in the ordinary way means considerable expense. For raising seedling trees on a large scale, the Forests Department uses a very cheap ingenious and indestructible pot. This consists of a strip of thin metal (tin, zinc, or galvanized iron may be used) something like an ordinary collar, but shorter and broader, and with the free ends bent over, one inwards and one outwards, so as to form an interlocking flange. When bent round and the flange interlocked, it forms a flower-pot with sloping sides but no bottom. As it stands on a slab no bottom is necessary, and by the time the seedlings are large enough to plant out the roots have bound the soil in the pot together. When planting, a little lateral pressure unlocks the flanges, the strip of metal unrolls, and the roots, with the soil around them, can be planted with a minimum of disturbance. Another method is to raise seedlings in short lengths of bamboos filled with soil, simply splitting the bamboo and planting the whole in the soil when the seedling is old enough. The tubes should be 4 to 6 inches long, and hollow throughout. If the tube is already soft, it need not be split before planting. Where preferred, however, plantations may be established by broadcasting the seed.'

It should be mentioned that the article from which this quotation is taken is the first (November 1912) in a series, by Professor A. J. Ewart, of Melbourne University, appearing in the *Journal of the Department of Agriculture of Victoria*, and although this is the only one that has been received so far, it may be concluded that the whole series will be worthy of the attention of those interested in the wattle barks.

As has been indicated, this subject will be continued in the next number of the *Agricultural News.*

MARKET REPORTS.

London.—The West India Committee Circular, January 28, 1913.

Arrowroot—3⅞*d.* to 5*d.*

Balata—Sheet, 3/6; block, 2/4 per lb.

Beeswax—No quotations.

Cacao—Trinidad, 68/- to 80/- per cwt.; Grenada, 62/- to 68/6.

Coffee—Jamaica, no quotations.

Copra—West Indian, £28 10*s.* per ton.

Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 17*d.* to 20*d.*

Fruit—No quotations.

Fustic—No quotations.

Ginger—Quiet.

Isinglass—No quotations.

Honey—No quotations.

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Logwood—No quotations.

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Pimento—2¼*d.* to 2 9/16*d.*

Rubber—Para, fine hard, 4/5¼; fine soft, 4/2; Castilloa, 3/8 per lb.

Rum—Jamaica, no quotations.

Sugar—Crystals, no quotations; Muscovado, no quotations; Syrup, 12/1½ to 15/6; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., January 24, 1913.

Cacao—Caracas, 14¼c. to 15c.; Grenada, 14c. to 14½c; Trinidad, 14¼c. to 14½c. per lb.; Jamaica, 11½c. to 13c.

Coco-nuts—Jamaica, select, $32·00 to $34·00; culls, $20·00; Trinidad, select, $32·00 to $34·00; culls, $20·00 per M.

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Grape Fruit—Jamaica, $1·52 to $3·00.

Limes—$5·50 to $6·00.

Mace—53c. to 57c. per lb.

Nutmegs—110's, 14c.

Oranges—Jamaica, $1·50 to $2·75.

Pimento—4½c. to 4¼c. per lb.

Sugar—Centrifugals, 96°, 3·48c. per lb.; Muscovados, 89°, 2·98c.; Molasses, 89°, 2·73c. per lb., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., February 3, 1913.

Cacao—Venezuelan, $15·00 to $15·30 per fanega; Trinidad, $14·00 to $14·75 per fanega.

Coco-nut Oil—99c. per Imperial gallon.

Coffee—Venezuelan, 14c. per lb.

Copra—$4·25 per 100 lb.

Dhal—No quotations.

Onions—$1·50 to $3·00 per 100 lb.

Peas, Split—$5·75 to $6·00 per bag.

Potatoes—English, $1·75 to $2·00 per 100 lb.

Rice—Yellow, $5·25; White, $6·75 to $7·00 per bag.

Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., February 8, 1913; Messrs. T. S. Garraway & Co., February 10, 1913; Messrs. Leacock & Co., January 31, 1913.

Arrowroot—$7·00 to $8·00 per 100 lb.

Cacao—$10·50 to $12·00 per 100 lb.

Coco-nuts—$24·00.

Hay—$1·50 per 100 lb.

Manures—Nitrate of soda, $75·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $85·00 per ton.

Molasses—No quotations.

Onions—$2·00 to $6·00 per 100 lb.

Peas, Split—$6·40 to $6·50 per bag of 210 lb.; Canada, $3·00 to $4·55 per bag of 120 lb.

Potatoes—Nova Scotia, $1·70 to $3·00 per 160 lb.

Rice—Ballam, $5·15 to $5·60 per 190 lb.; Patna, no quotations; Rangoon, no quotations.

Sugar—American granulated, $4·50 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, February 1, 1913; Messrs. Sandbach, Parker & Co., January 31, 1913

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	——	——
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	72c. per lb.	——
Cacao—Native	18c. per lb.	19c. per lb.
Cassava—	80c.	——
Cassava Starch—	$6·50	——
Coco-nuts—	$16 to $20 per M.	$10 to $16 per M.
Coffee—Creole	17c. per lb.	19c. per lb.
Jamaica and Rio	18c. per lb.	20½c. per lb.
Liberian	13c. per lb.	13c. per lb.
Dhal—	$3·75 to $3·90 per bag of 168 lb.	$4·75 to $5·00 per bag of 168 lb.
Green Dhal	$5·00	——
Eddoes—	60c. to 72c.	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	9c. to 10c. per lb.	7c. to 10c. per lb.
Peas—Split	$7·50 per bag (210 lb.)	$7·30 per bag (210 lb.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	$3·00	$3·25
Lisbon	——	——
Potatoes-Sweet, B'bados	$1·20 per bag	——
Rice—Ballam	No quotation	——
Creole	$4·50 to $5·00	$5·00
Tannias—	$1·68	——
Yams—White	$1·68	——
Buck	$1·68	——
Sugar—Dark crystals	$2·30 to $2·40	$2·50 to $2·60
Yellow	$3·00 to $3·25	$3·25 to $3·50
White	$4·00	$5·00
Molasses	$2·40 to $2·60	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
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,, Cordwood	$1·80 to $2·00 per ton	——

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Water and Life.

II.

THE consideration of water in relation to its use and formation in life-processes was commenced in an editorial article in the last number but one of this journal. Attention was drawn to the facts that water is formed in living beings through respiration, both direct and intramolecular; and that this water has uses less obvious than those chiefly served by the water absorbed in the ordinary way: namely those of forming soluble substances by hydrolysis and of being freed by the process of dehydration so that growth may ensue. The purpose of the present article is to extend and illustrate the subject by reference to specific examples of the use of metabolic water which derive a large importance from their being matters of daily life.

The publication* mentioned already, which gives its chief attention to these facts, considers them first in regard to the life and germination of seeds. It is well known that many kinds of seeds may be kept for long periods, and will still germinate, even if they have been exposed to air dried by sulphuric acid and have therefore lost as much water as can be extracted from them without heating. It is also realized that, for this, the seed must have remained alive, and respiration, howbeit very slow, must have continued. This slow respiration ensures the presence of at least a small quantity of water in all living seeds. The existence of such respiration is shown by the constant evolution of carbon dioxide and the loss of dry matter from the seed. Practical recognition of these matters is seen in the air-drying of seed that is to be kept, to lessen respiration; and in the storing of seeds in such a way that ventilation for continued respiration, and therefore for life, is ensured.

Direct respiration does not occur in immature seeds: it could not, indeed, as they are usually enclosed in a fruit, away from the air. When the seed is mature, this respiration is set up and enzymes are formed, so that the stored food is digested The absence of respiration and its results, from seeds in a fruit, accounts chiefly for the fact that they rarely germinate in the fruit, although they are surrounded by an abundance of moisture.

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* *Wisconsin Research Bulletin*, No. 22.

Common observation teaches that the sprouts from a seed always contain a much greater proportion of water than the remainder of the seed. In this very early stage of the seedling, there is little provision for the direct absorption of water, and the latter must be formed in some way in the developing embryo. The fact is that the newly-formed tissues are respiring actively, while no respiration is taking place in the old parts of the seed; so that the former are more succulent simply because of the large amount of metabolic water arising from their rapid respiration.

In order to form a mental picture of what takes place through the action of light in green leaves, and in further changes brought about in the cells of the plant, it must be realized that the formation of different kinds of carbohydrates is all-important in these matters. These carbohydrates may be regarded, for the purposes of the present discussion, as substances that differ from one another in the proportion of the elements of water that they contain; that is, in their state of hydration. Among carbohydrates possessing the highest hydration are the sugars dextrose and levulose; starch and cellulose (the latter the stuff of which cell walls are chiefly made) represent the lowest state of hydration among these bodies, while there are many carbohydrates intermediate between these, in this respect. The first stable carbohydrate to be formed in green leaves is starch, which is hydrolysed by enzymes to a soluble carbohydrate, usually dextrose, and this travels through the plant from cell to cell, by osmosis. Intramolecular respiration within the cells causes part of the dextrose to be oxidized to carbon dioxide and water, and the energy thus liberated brings about the dehydration of other parts of it to form bodies such as cellulose, starch and cane-sugar. It is in this way that the starch stored in plants, and the cellulose of the cell walls, are formed; and in the meantime the water arising from the intramolecular respiration travels (together with water from the roots) away from the cells to the leaves, carrying with it the waste products of metabolism. It is a peculiar property of plants, in distinction to animals, that they can reconvert these waste products into useful nutrients, this work being one of the functions of the leaves. A matter of interest is that the same group of atoms may complete the cycle several times, carrying combined water from the leaves to the growing cells, and finally becoming oxidized in respiration or receiving a last dehydration and being deposited as permanent tissue.

Fruits, again, afford an example of the usefulness of metabolic water. The final ripening of most fruits will take place after they have been removed from the plant, and this indicates that the water required for the increased succulence attendant on maturity is not derived from the plant on which they grow. Respiration occurs in ripening fruits, so that water is formed in them, and their juiciness also becomes greater because the proportion of soluble substances increases as they mature. It may be proved that respiration is necessary in the process by withholding oxygen, when instead of ripening normally, the fruits will undergo changes similar to those that take place in ensilage.

It has been shown that animal cells respire in a manner similar to those of plants, with the same general results. The metabolic water from this respiration weakens the solution of the cell contents, so that food materials pass from the stronger solution in the blood, through the cell walls, by osmosis. This is the way in which a constant flow of nutrient toward the the tissues is ensured, so that the material used up in respiration and growth may be replaced. The great difference between plants and animals, as has been indicated, is that animals cannot use the waste products for building up fresh nutrients; these must be excreted quickly, or the tissues will be poisoned. It is of interest to consider how this excretion takes place in different kinds of animals.

The form in which nitrogenous waste products from most animals are excreted is a soluble body called urea, whose removal requires the use of a large quantity of water. Insects, birds and reptiles, however, get rid of the waste in the form of insoluble salts of uric acid, which pass out of the body with a minimum loss of water. As uric acid contains a smaller proportion of hydrogen than any other nitrogenous compound excreted by animals, this fact in itself helps to lessen the loss in the case of the latter animals. This means that insects, birds and reptiles lose little of their metabolic water in the process of excretion; while if ordinary animals are fed on a diet containing minimum quantities of nitrogenous substances (proteids), less metabolic water will be required for that process. The practical results of this may be considered, taking the latter case first.

The matter possesses its importance, in the higher animals, in the case of those which hibernate. In this dormant condition, the animal disposes itself so that evaporation is reduced as much as possible; but the chief saving of metabolic water is effected from the circumstance that the animal exists on a nitrogen-free food-supply—its own fat—so that the amount of urea to be excreted, and therefore the amount of water to be lost in this way, is made very small. Thus the animal is able to exist without water for a long time. In the same way, the camel is able to utilize the fat in its hump, during long journeys in the desert.

The significance, again, of the matter in relation to insects, birds and reptiles, is evident chiefly in the case of many of the first kind—insects that feed on air-dried food and never require supplies of free water. Among such insects are the clothes moth (*Tinea pellionella*), the Mediterranean flour moth (*Ephestia kühniella*) and the bee moth (*Galleria mellonella*), possessing larvae which contain from five to ten times the amount of water in the food they eat. Their nitrogen waste is excreted as uric acid, which is insoluble and therefore only slightly poisonous; and little loss of water accompanies the excretion. They are thus able to utilize metabolic water for the needs of the tissues to a far greater extent than is the case with the higher animals.

What has been said assists the realization of the important part played by the water that is formed in living beings; and suggests that such metabolic water would be sufficient for the needs of all animals, if it was not required to aid in the elimination of poisonous substances formed by the breaking-down of nitrogenous food materials.

SUGAR INDUSTRY.

WEST INDIAN SUGAR-CANES IN QUEENSLAND.

A continuation of the trials, in Queensland, of certain varieties of West Indian sugar-canes is described in the Annual Report of the Bureau of Sugar Experiment Stations (1912).

Near the commencement of the report, analytical and crop results are given in regard to certain Queensland canes, to B.147 and Mauritius Malagache. It may be remembered that the suitability of B.147 in Queensland, in 1911, has already been referred to in the *Agricultural News*, in Vol. XI, p. 371, and the trials during 1912 have confirmed the previous year's results. In the first place the extreme dryness of the season caused the ratoon crop, with the exception of B.147 and Mauritius Malagache, to become so backward and stunted that the greater part of the crop had to be ploughed out. In the crop results of the plant canes, B.147 headed the list with 16·0 tons of sugar per acre, Mauritius Malagache came second with 15·9 and Q.121 third with 14·5. One Queensland cane gave only 2·4 tons of sugar per acre.

In the experiments with miscellaneous canes (final analysis) the following figures, showing the percentage of sucrose in the juice, should be of interest in the West Indies: D.1135 gave 14·54; Q 1900, 17·56; B.208, 17·72; Couvé (Mauritius), 11·99.

In regard to crop results, D.1135 gave 33·3 tons per acre, yielding 4·3 tons of sugar; B.208 gave 29·9 tons per acre, yielding 4·7 tons of sugar; Q.1900 gave 27·4 tons, yielding 4·3 tons of sugar.

Of the Demerara seedlings, 1135 is the favourite. It is grown very largely in the Bundaberg district where it has secured general approval as suitable both for farmers and for the mills.

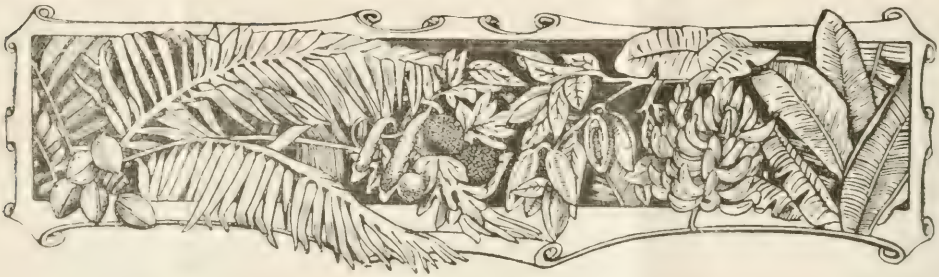
SUGAR-CANE EXPERIMENTS IN ASSAM.

It is stated in the Report of the Agricultural Department, Assam, for 1912, that the chief feature of the year's work has been the remarkably good results obtained from the trials of three Barbados varieties of sugar-cane, B.376, B.147, and B.208. These varieties are said to have improved enormously during the last two or three years, and especially since they have been grown on land which has been limed. During 1912, B.376 (ratoon) gave 3·8 tons of total sugar per acre and 3·7 tons of cane sugar.

In the appendix of the report it is stated: 'Some of the exotic varieties introduced from Barbados and elsewhere are now fairly well acclimatized and showing most excellent promise, giving yields up to and just over 30 tons of cane per acre with only moderate manuring, and yielding a juice very rich in cane sugar and remarkably free from other solid matter, i.e. of exceedingly high purity (over 90 per cent.). Such canes are admirably suited to central factory work; the one point above all others which emerged from the discussion before the recent Board of Agriculture on sugar-cane, was the prime necessity for the introduction of higher-class canes into the cultivation of this country.'

A beginning has already been made in Assam upon a forward policy of expansion with regard to sugar-cane cultivation in general. Investigations concerning such problems as drainage, time of planting, manuring, methods for combating borer and disease, as well as seedling selection, are now in progress, and efforts are being made to reduce the production charges in cultivation particularly in so far as this can be effected by substituting machinery in the place of manual labour.

The Cuban sugar crop is reported on in the *Louisiana Planter*, for January 25, 1913, as follows: 'The weather has been generally favourable for grinding during the past week throughout the island though a colder temperature would have been welcome on account of its effect upon the yield. Although still irregular in different localities the yield is improving steadily everywhere, and is a good deal better than last year's. Complaints regarding the shortage of labour to cut cane are made in a good many places. In Santa Clara province it is stated that a large number of hands have been drawn away to Orient, and a strike has been declared in Mantanzas. Since writing the above we learn that the strike has been settled.'



FRUITS AND FRUIT TREES.

CONFUSION IN THE NAMES OF CERTAIN FRUITS.

A great deal of antipathy exists amongst the general public in regard to the use of the scientific names of plants. Indeed, the presence of a number of Latin names in italics in a popular article may frequently have the effect of rendering it distinctly unattractive. The use of scientific names, however, instead of rendering information exclusive, should actually have the opposite effect in extending its utility, by enabling people in different places, may be speaking different tongues, to understand exactly and quickly to what species the information refers. For many species are called in different places, and even in the same place, by different popular names; unfortunately, too, some ambiguity may exist even in the use of the scientific names, for what is really one species is often given different names by different describers, or one name may be used to refer to more than one species. In order to avoid misconceptions concerning these synonyms and homonyms, as they are called, it is customary to place the name of the describer after the scientific name; and, from time to time, systematists review these specific names critically, thereby removing to a large extent the ambiguity, by definitely stating what terms are to be regarded as synonymous. Scientific work of this nature is obviously of international importance, but it is often much undervalued by the general public.

A case in point, where the existence of synonyms and homonyms still gives rise to considerable confusion, is afforded by the publication of a monograph by Wester of the Bureau of Agriculture, Manila, entitled A Contribution to the Nomenclature of the Cultivated Anonas. The genus Anona includes the Cherimoyer, *Anona cherimolia*, Miller; the sugar apple, *Anona squamosa*, L.; the custard apple, *Anona reticulata*, L.; the soursop, *Anona muricata*, L.; and the Mamon, *Anona glabra*, L.

The sugar apple, the custard apple and the soursop are well-known fruits in the West Indies and the Cherimoyer though not known so well is nevertheless largely cultivated in the sub-tropics and in the tropics at high altitudes. It may be remembered that the cultivation of this plant was recently described in the *Agricultural News*, Vol. XI, p. 388.

The point, however, of Wester's monograph is that, with the increased attention that is being given to the Anonas by fruit growers, it is very necessary to avoid confusion of names. At present *Anona cherimolia*, Miller, has no less than fifteen different names, most of them popular; *Anona reticulata*, L., has twenty-nine; *Anona muricata*, L., thirty-five; whilst the sugar-apple, *Anona squamosa*, L., has no less than fifty-five. In several instances a name is used to refer to more than one species, for instance, Chirimoya is used for *Anona cherimolia* in Cuba, and for *A. squamosa* in Porto Rico; whilst in Mexico, the popular name Quauhtzapotl is applied to the three species *A. reticulata*, *A. cherimolia*, and *A. squamosa*.

In spite of public antipathy, then, it may prove to be convenient, commercially, to refer to the different Anonas by means of the scientific names which are given in this article.

CACAO EXPERIMENTS ON THE GOLD COAST.

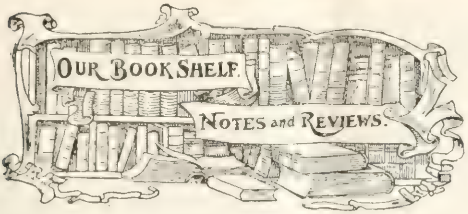
An interesting account of cacao experiments appears in the Annual Report of the Agricultural Department of the Gold Coast for 1911, from which the following is taken:—

The three old plots of the common variety in this Colony (Amelonado) growing in the Agricultural Station, Aburi, planted in 1891-1893 have given a larger crop of fruits than in any year since accurate records have been kept.

There are now 465 trees in these plots. The average number of pods produced by each tree for the three years has therefore been 96·7 pods: many of the largest and best pods are used annually for propagation purposes. As a result of several experiments it has been found that twelve to thirteen average pods yield 1 lb. of cured cacao; and on this basis the average yield per tree has been 7·5 lb. to 8·1 lb. of cured cacao, an extremely satisfactory result.

These trees although they are now nineteen to twenty-one years old exhibit an extremely healthy appearance considering that they have received no treatment other than is within the reach of the native farmer, namely: a periodical hoeing to keep down weeds, any necessary light pruning, spraying, and general care, and the application of a 'mulch' (grass, leaves, etc.) as available. Two years ago a light dressing of lime was also applied to the soil.

The increased yield obtained in the second year from the three plots of previously abandoned cacao on the Assuantsi Agricultural Station are particularly gratifying and indicate very forcibly, and in a practical way, the benefits derived from giving proper care and attention to the trees.


Our Book Shelf.
Notes and Reviews.

PROBLEMS OF THE ANTILLES. By Norman Lamont. *Simpkin, Marshall, Hamilton, Kent & Co. Ltd., London.* 2s 6*d*. net.

The contents of this book are described shortly in the sub-title, which is: A Collection of Speeches and Writings on West Indian Questions. Some of the writings have appeared already in the *Contemporary Review* and the *Empire Review*, and are reproduced by permission of the editors of those magazines; while others among them are letters on West Indian subjects that have been written by the author to various journals.

Of the first two chapters, that of the most general interest gives a memorandum prepared by Mr. Lamont for the West Indian Royal Commission of 1897. Like many other parts of the book, this now possesses its chief interest and use in that it provides some assistance in obtaining an idea of the agricultural progress made by a West Indian island—Trinidad in this case—during the past fifteen or sixteen years. Chapter IV, The West Indies: A Warning and a Way, was written originally for the *Empire Review*, in 1902. It deals with suggestions for improved sugar production, both in the field and the factory; labour problems—particularly in Trinidad; and the need for the better training of those in charge of the work on estates, with encouragement of the local men. This constitutes the Warning. In the years since it was given, progress has been made, in some directions, which makes part of the criticism of the methods of sugar production no longer deserved to the same extent. It is the part called the Way that will engage the most interested attention at the present time, for it deals with the all-important subject of a university of tropical agriculture for the West Indies. It is natural that the lapse of time since the article was written, and the greater consideration that the matter has received, should have caused some of the suggestions to become out-of-date, as for instance that such an institution should necessarily be situated in Barbados: Mr. Lamont has recently expressed his disagreement with this, as a necessity. In a more general way, it is proposed that some of the special courses should be taken in different islands; whereas the later leaning now seems to be to the idea of a university as self-contained as possible, in an island where the diversity of crop subjects (not to say of pests and diseases) would provide educational material close at hand. This arrangement would not preclude the use of travelling scholarships, and would tend to the development and continuation of that 'university spirit' whose importance seems likely to be forgotten in the consideration of the more directly utilitarian aspects of the project. The reviewer is tempted by the present prominence of this subject to the further discussion of many of the points raised, but it must be sufficient here to recommend the perusal of the article itself.

Chapters V and VI, which succeed, have relation to matters that are more distinctly political; while the next three chapters, and chapters XII, XIII, XV and XVI, have their special interest in Trinidad. In chapter XI there is presented matter that may well be read with the other writings that have been put forward lately, in connexion with West Indian Federation. Chapter XIV deals in an interesting and lively manner with a proposal to surrender the West Indies to the United States in return for the Philippines. Chapter XVII, an address on Thoroughness, to the Port of Spain Brotherhood, adds to the variety of the subjects in the book; while chapters XVIII and XIX conclude the work by giving attention respectively to the improvement that has taken place in West Indian agricultural and commercial conditions, and to the decision of the British Government to withdraw from the Sugar Convention.

Enough has been said to indicate that the matter in the book is both interesting and varied. Its appeal is naturally greatest to those who know and appreciate the West Indies, and who sympathize with Mr. Lamont and others like him, who can find time to devote their energy in a public way to the furtherance of the interests of these Colonies. It has been indicated that part of the value of the book is in the fact that the author has dared to include material presented in former years. If he had done this alone, its publication would have been justified, as an attempt to lessen the prevalent tendency to try to gauge progress from the present appearance of things, instead of making comparison with the past.

DEPARTMENT NEWS.

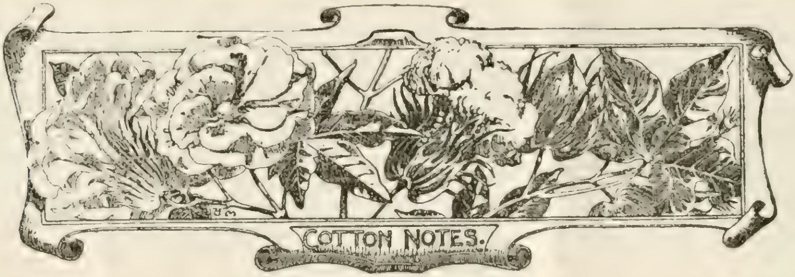
The Imperial Commissioner of Agriculture is expected to return to Barbados on March 3, by the SS. 'St. Thomas', from an official visit to Antigua.

Cotton in the Philippines.—One of the principal lines of the activity of the fibre office during the fiscal year 1913 will be to carry on an extensive line of experiment work in cotton. This will include native species and types of cotton as well as others imported from the United States and Egypt.

A systematic study and investigational work with cotton has not yet been made; but from the preliminary investigation made during the past year, certain native types of cotton were found to exhibit such encouraging results that it was deemed, not only advisable, but also necessary, that a more detailed and more systematic investigation be carried on.

Through the co-operation of the demonstration and extension division, this division has been able to secure samples of lint and seed from the principal native species of cotton in Panay and Cebu, and also tentative descriptions and information about these species. The sample of seed and lint of the above mentioned, and other species secured by the fibre expert, have been sent to the United States Department of Agriculture at their request. Their tests and experiments, combined with the results which we hope to arrive at here, promise very interesting and important information about the cotton industry in general.

The object of the cotton investigation is to encourage the production of this crop in sufficient quantities to supply the local demand for raw cotton and yarn, and for the local manufacture of cheap cotton goods. The larger part of the importations of the first two classes and a large part of the third come from China and other eastern countries. (Annual Report, Philippine Agricultural Department, 1911-12; in the *Philippine Agricultural Review*, Vol. V, No. 13.)


COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date February 10, with reference to the sales of West Indian Sea Island cotton :—

A good business has been done in West Indian Sea Island cotton since our last report, in spite of the fact that the fine spinning trade is still in a not very flourishing condition. The demand runs on the finer qualities of cotton, all inferior growths being difficult of sale, owing to the relative cheap price at which Sakellarides Egyptian cotton is offering.

The sales amount to between 250 and 300 bales, and include good qualities of St. Kitts, Nevis, Barbados and Montserrat from 18*d* to 20*d*. and a few choice St. Vincent at 22*d*

The future course of prices depends almost entirely on the quantity of West Indian which comes forward. Buyers are anticipating that the crop will be a short one and are therefore supplying their wants for this season.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending February 1, is as follows:—

There was some better demand this week, resulting in the above sales which consisted principally of odd bags classing Fine to Extra Fine at 26c. to 28c., and a few Planters' crop lots at 31c. to 36c., the buying being for England and the Northern mills.

There were also some sales of deep tinged cotton at 16c. for the Continent, and Extra Fine off in preparation at 25c. for England and France.

The Factors are showing more disposition to sell and are willing to make concession to meet the views of buyers.

We have left in stock 400 to 600 bales of Fine to Fully Fine off in preparation which are seeking sale, and with orders in hand can probably buy at 20c. to 22c. This quality looks relatively cheap and should attract the attention of spinners.

Extra Fine	28c. to 29c.	= 16*d.* to 16½*d.*	c.i.f., & 5 per cent.
Fully Fine	26c. to 27c.	= 14¾*d.* to 15¼*d.*	,, ,, ,, ,,
Fine	26c.	= 14¾*d.*	,, ,, ,, ,,
Extra Fine off in preparation	25c.	= 14¼*d.*	,, ,, ,, ,,
Fully Fine off in preparation	23c.	= 13*d.*	,, ,, ,, ,,
Fine off in preparation	20c.	= 11½*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, to February 1, 1913, were *nil*, 207 bales, and 2,600 bales, respectively. Last year they were 3,360, 9,435 and 5,670 bales.

BRITISH COTTON GROWING ASSOCIATION.

The following account of a recent meeting of the Council of this Association has just been received:—

The one hundred and eighth meeting of the Council of the British Cotton Growing Association was held at the offices, 15 Cross Street, Manchester, on Tuesday, February 4. In the absence of the President (the Right Hon. The Earl of Derby, G.C.V.O.) Mr. J. Arthur Hutton occupied the Chair.

SUDAN. It was considered that the result of the Deputation to the Government with reference to developments in the Sudan was most gratifying, and much satisfaction was expressed at the prompt and favourable reply which had been given by the Prime Minister. A cable had been received by the President from Lord Kitchener, expressing thanks for what had been done, and Sir Reginald Wingate (the Sirdar) had also cabled to the effect that the result of the Deputation was much appreciated.

The opinion was expressed that nothing which had happened in connexion with the work of the Association had created so great an impression on the general public as the result of the Deputation.

The reports received from both Zeidab and Tayiba are exceedingly satisfactory, and it is hoped that the arrangements for the Government loan of three millions will soon be completed, so that the proposed developments may be proceeded with as quickly as possible.

It was unanimously resolved that the Right Hon. Sir William Mather, P.C., be elected a Vice-President of the Association in recognition of the valuable services rendered by him in connexion with cotton-growing in the Anglo-Egyptian Sudan.

WEST AFRICA. In view of the renewal of the grant from the Imperial Government it has been decided to continue the cotton-growing operations in the Northern Territories of the Gold Coast, and also at Labolabo, in the hope that the next three years will give some definite results.

The purchases of cotton at Lagos for 1912 amounted to 9,146 bales, as compared with 5,408 bales for 1911, and 5,626 bales for 1910. For the first three weeks of the present year the purchases amounted to 209 bales, against 92 bales for the same period of last year. In Northern Nigeria the purchases for 1912 were 2,627 bales, as compared with about 600 bales for 1911.

NYASALAND. Reference was made to the visit of Sir William Manning, the late Governor, and the opinion was expressed that as a result of this interview it would be possible to solve many of the difficulties which were at present encountered in connexion with the transport, labour and other problems. Sir William Manning was convinced that cotton-growing had now been firmly established in Nyasaland, and the industry would develop from year to year, more especially when the proposed railway extension had been completed. It was reported that the export of cotton from Nyasaland for the year ending September 30, amounted to 1,230,630 lb. valued in Nyasaland at £30,765, which shows an increased value of £14,894 over the previous year.

UGANDA. The reports as to the crop in Uganda continue satisfactory, and the cotton which is coming forward is commanding a ready sale at satisfactory prices, although there is a good deal of competition in cotton-buying and the buying prices have been raised to a level which leaves very little margin of profit.

The account closes with a financial statement showing that on February 6, the balance to be raised to complete the authorised capital of the Association, namely £500,000, was £18,933. On November 7, 1912, it was £22,860 and on October 1, 1912, £23,339.

THE WEST INDIAN COTTON-GROWING SEASON, 1911-12.

In consequence of an error in the figures sent from Antigua, it is necessary to reproduce in corrected form, the following table of West Indian cotton statistics, which appeared in the *Agricultural News*, Vol. XII, p. 22.

WEST INDIAN COTTON EXPORTS, QUARTER ENDED SEPTEMBER 30 1912

Origin.	No. of bales.	Weight, lb.	Estimated value.		
			£	s.	d.
Antigua	61½	13,281	830	1	3
Barbados	79	37,428	2,339	5	0
Grenada	3	631	28	14	6
Montserrat	1	272	22	13	4
St. Kitts	35	12,195	762	3	9
Nevis	24	6,025	376	11	3
Anguilla	10	2,000	125	0	0
St. Vincent	14	3,977	314	16	11
Trinidad & Tobago	6	1,294	194	0	0
Virgin Islands	None.				
Jamaica	57	20,175	1,538	2	6
Total	290½	97,278	6,531	8	6

WEST INDIAN COTTON EXPORTS, OCTOBER 1, 1911, TO SEPTEMBER 30, 1912.

Origin.	No. of bales.	Weight, lb.	Estimated value.		
			£	s.	d.
Antigua	800	177,472	11,865	11	4
Barbados	927	455,689	28,112	5	4
Grenada	1,269	380,264	12,691	3	10
Montserrat	947	344,753	22,975	10	7
St. Kitts	782	332,168	21,251	19	7
Nevis	513	165,329	10,643	12	3
Anguilla	460	97,142	6,269	11	10½
St. Vincent	1,532¾	533,938	40,514	5	4
Trinidad & Tobago	45	12,263	1,017	0	0
Virgin Islands	233	51,677	3,037	5	0
Jamaica	113	38,529	2,871	14	2
Total	7,621¾	2,589,224	161,250	5	3

RECENT PUBLICATIONS ON THE FERTILITY OF THE SOIL.

Dr. Russell has lately been writing on this subject in *Nature* (December 26, 1912) and has presented a broad review of the more striking discoveries that have recently been made in different parts of the world. Reference is made first of all to investigations of the hypothesis that increased fertility of agricultural land in established countries through the use of commercial fertilizers and green manuring is effected at the expense of virgin lands. An inquiry has been instituted by Coventry, in India, to see if there is any evidence of a progressive decline of fertility there. It has been found that the average of productivity may have become lower, but this can be entirely explained by the fact that inferior land has been taken into cultivation because of an extension of agriculture, resulting from the high degree of prosperity that at present prevails.

It cannot be disputed, however, that there is a continuous transfer of phosphoric acid and potash from the soil to the great centres of population, and the impoverishment of virgin soils necessarily takes place. The productivity is however not affected until the lack of these particular nutrients becomes a limiting factor in crop production. This position has been reached in certain parts of the United States, and the recent work of Professor Wilson and his colleagues at the Wisconsin Experiment Station has shown that continued cropping has caused phosphate exhaustion that can be remedied by dressings of rock phosphate, which fortunately is readily obtainable.

A very remarkable illustration of the other side of the question, namely the increased phosphorus supply to land near cities, is contained in a recent paper by Messrs. Hughes and Aladjem, published in *The Agricultural Journal of Egypt*. These investigators, during the course of a soil survey, discovered that certain spots of land in the Delta were very much richer in phosphates than usual. Detailed examination revealed the fact that these remarkable areas constituted the site of an ancient city where a considerable population had existed for a period of at least four thousand years before the Arab domination. 'The city and its population have long vanished,' writes Dr Russell, 'but the concentration of phosphoric acid in the soil remains an indelible record of the past.'

In considering the transference of nitrogen compounds, it has to be borne in mind that this takes place in the form of a perpetual cycle in which the air takes an important part, and the chemical changes are mainly of a biological nature. The increase of soil nitrogen can be obtained in other ways than by the direct application of nitrogen compounds. Quite recently, the Department of Agriculture for the Leeward Islands has published results showing that the addition of molasses tends to increase the activity of nitrogen-fixing organisms like Azotobacter and Clostridium, and in sugar-producing countries this indirect method of manuring may possibly develop into a matter of economic importance. There is also the recent work on the effect of flowers of sulphur, and of carbonates of calcium and magnesium upon the nitrogen transformations in the soil, which has lately received attention in the *Agricultural News*.

One of the latest developments in the science of soil fertility is the work of R. O. E. Davis, in America, on the existence and functions of colloids in the soil. These substances cover the soil particles and exert a very considerable influence upon the physical properties of the soil.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

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Agricultural News

Vol. XII. SATURDAY, MARCH 1, 1913. No. 283.

NOTES AND COMMENTS.

Contents of Present Issue.

The leading article in this number continues, in an illustrative way, the consideration of water in relation to the life of animals and green plants. Part I of the article appeared in the last issue but one of the *Agricultural News.*

Interesting facts concerning West Indian varieties of sugar-cane abroad, are given on page 67.

On page 68, appears an article dealing, in a concrete manner, with the importance of scientific names.

The recent work entitled Problems of the Antilles, by Norman Lamont, is reviewed on page 69.

Under the heading Insect Notes, on page 74, an account is given of the work of the Entomological Research Committee, now to be known as the Imperial Bureau of Entomology.

The subject of Wattle Bark is continued from the last issue of the *Agricultural News,* on page 75. It is intended to publish a third and last article on the subject in the next number of this journal.

The Fungus Notes, which will be found on page 78, describe recent work, chiefly in Hawaii, on entomogenous fungi.

A University in the Tropics.

This subject, which was dealt with editorially in the last issue of the *Agricultural News* as the outcome of a recent leading article in *The Times,* receives further sympathetic consideration in an article in *Nature* of January 30, 1913. The various suggestions, already indicated in connexion with the proposed scheme, are given unqualified support in this article, and in conclusion it is stated: 'It would seem clear that the site for the institution must be sought in the Antilles. Nowhere among these islands do we find all the requisite conditions so fully met as in the easily accessible and beautiful island of Trinidad.'

The matter has received still further attention in the form of a letter by Colonel Arnold to *The Times* of February 3, 1913. In this it is pointed out that one of the crying needs of the Tropics is for a central institution situated there, of which the object is not only to teach practical agricultural workers and experts, but also to collect and collate scientific results, thus providing reliable information of wide application in tropical agricultural practice.

Oil from the Mexican Poppy.

The Mexican poppy (*Argemone mexicana*) is well known in the West Indies as a noxious weed of cultivated land in dry districts. It is indigenous, as its name implies, to Central America, but has become naturalized in nearly every part of the Tropics. In India, oil is extracted from the seeds of this plant, and the properties of the oil are described in the *Agricultural Ledger*, 1911-12—No. 5.

By ordinary pressure the seed yields 25 to 30 per cent. of orange-coloured oil—a quantity equal to that obtained from rape seed. Its specific gravity at 15·5°C. is 0·9247, and its saponification value is 190·3. The oil gives, with nitric acid, an orange-red colour. It dries to a hard jelly, gaining during the process 8 per cent. in weight—an amount which corresponds with that absorbed by poppy seed oil.

In India, the oil is used for burning in lamps, and is employed by painters as a drying oil, and for giving a shining appearance to wood. The seeds and oil are acrid and purgative. It is probable that the acridity will prevent the attacks of white ants and borers. The oil readily saponifies and gives a hard soap with soda.

In view of the high price of linseed oil, it might prove profitable to extract this oil in the West Indies, for purposes of consumption in the local industries.

In connexion with this plant it is interesting to note further that the farmers in New South Wales have endeavoured to get the Mexican poppy removed from the official list of noxious weeds, since they regard it as good fodder for stock (*Tropical Agriculturist,* Vol. XXXIV, p. 428); whilst another reference (*Agricultural Ledger,* 1905, No. 3) makes the interesting statement that the plant is a common weed of nitre-bearing land, and that an American investigator has found potassium nitrate normally present in the ash in notable quantity

International Organization of Agricultural Meteorology.

Important work has been done, in the course of a few sittings, by the Commission nominated by the International Meterological Committee, to consider the development of an extensive scheme whereby systematic observations of atmospheric phenomena may be instituted in different countries in a co-operative way, for the direct benefit of agriculturists in general. It is stated in the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases*, for December 1912, that the Committee attached the greatest importance to the regular publication of statistics, and to their thorough distribution among rural populations by means of special distinct centres. It is suggested, too, that the price of these publications should be kept as low as possible. To ensure the proper utilization of the information, it is suggested that these publications should be used for educational purposes in schools and colleges.

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Variability in the Quality of Seeds and Cuttings.

The relatively large number of crops that are propagated by the use of cuttings and by other vegetative means, is a characteristic feature of tropical agriculture. Another notable feature is the relatively large size of the seeds of those plants which are reproduced sexually, as well as the fact that generally this seed is sown in nursery beds previous to planting out the seedlings in the field or orchard. There are one or two exceptions, for instance, cotton, maize and sometimes rice are sown in the field direct; but, in a general way, it may be stated that the reproduction and establishment of economic plants, together with methods of 'seed' supply receive greater personal supervision in the tropics than do these matters in other parts of the world.

In commenting on several interesting points brought out in an article on Seed Analyses, in a recent number of the *Journal of the Board of Agriculture*, it is necessary to take into consideration these general features of tropical plant reproduction.

It is pointed out in the article referred to, that seeds—a better term under tropical conditions would be 'planting material'—are by far the most variable things the agriculturist has to purchase or produce: weight for weight they are the most costly, and finally the entire success or failure of a crop (and even of succeeding crops) may be wholly determined by the kind or condition of the material planted.

Variability in quality shows itself mainly in the degree of purity and germination capacity. For reasons already indicated, degree of purity cannot vary to a large extent in tropical planting material unless the intermixture of different strains, or infection with disease, be included under this heading. On the other hand, germination capacity varies very much, the chief causes being maturity of 'seed' at time of collection, climatic conditions and exposure during the flowering period, age of 'seed', and lastly, mechanical injury caused by careless handling, or by insect pests in the field or during storage.

Age is perhaps the most important cause, in the Tropics, of variation in germination capacity. Planting material in the Tropics is typically succulent: the long-distanced and necessarily slow, distribution under warm conditions reduces germination capacity mainly through the loss of moisture, and unless special packing is resorted to, and unless the matters attendant on this distribution be dealt with promptly and with care, there must always be variability in the germination capacity of the transported material.

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Citrus Exports from South Africa, in 1912.

The large amount of organized attention which the South African citrus industry receives, is made evident in an article on the above subject, which appears in the *Agricultural Journal of the Union of South Africa*, for December 1912.

In this it is stated that during May to September, nearly 25,000 boxes of fruit, consisting principally of oranges, were exported from South Africa for the London market, this being an increase over the exports for the previous years. Reports on the condition of the fruit on its arrival in England were received regularly from the Trades Commissioner in London, and from many of the leading fruit merchants of Covent Garden. Their reports, on the whole, were not of a satisfactory nature: sometimes the oranges were not sweet enough and had apparently been packed too green; often there was a considerable amount of scale on the fruit, and frequently the fruits were badly sized. In several boxes of navel oranges, the fruit had even been damaged by the packers.

The importance of standard boxes is strongly emphasized. The proper size is 26 inches by 12½ inches by 12½ inches, outside. The Government Fruit Inspectors at the ports will not pass any but boxes made in accordance with the regulation size, so that should any odd sizes be offered for shipment they can only go forward in the ordinary hold and not in the cool chambers provided by the steamship company for inspected fruit. Shippers of extra selected oranges, however, have been catered for in future by the quoting of a special single-layer box. In connexion with packing, considerable dissatisfaction has been created on the market through the employment of 'wood-wool' for purposes of protecting the fruit.

To show in a concrete manner the value of good packing, it may be stated that careful shippers have been getting 17*s.* 6*d.* per box, whilst the careless ones obtained only 3*s.* 6*d.* to 6*s.* 6*d.* per box.

It is further pointed out in the same article that although these adverse reports may not prove, in all cases, pleasant reading, they should nevertheless be accepted in the proper spirit, and made to serve as a foundation on which to base a general all-round improvement. The same principle applies to similar affairs in the West Indies.

INSECT NOTES.

THE ENTOMOLOGICAL RESEARCH COMMITTEE.

A brief account of the Entomological Research Committee was presented in the *Agricultural News* for March 18, 1911 (Vol. X, p. 90), where mention was made of the first objects of establishing this Committee, and of some of the results which had then been attained.

That account was written about two years after the Entomological Research Committee had been established; and now that another period of similar length has passed, it should be of interest to review again the progress that has been made, and to consider the outlook for the future.

Up to the present time the main objects and efforts of the Committee have been the increase of accurate knowledge in regard to those insects, mites and ticks which cause or disseminate any of the diseases of man or domestic animals, and it seems likely that this line of work will continue to absorb its principal energies for years to come. The problems in this connexion which present themselves for solution in Tropical Africa are those for the study of which the Entomological Research Committee was founded, and they are of course the ones to which the larger part of its attention has been given. The Committee has not, however, neglected the needs of agriculture in Africa nor the needs of both health conditions and agricultural pursuits in other parts of the Empire; this will be revealed by a glance at the tables of contents of the Bulletin issued quarterly by the Committee, where will be seen titles of papers relating to agricultural entomology in both Africa and the West Indies, and to insects and diseases in the West Indies, as well as in those districts of Africa where European travellers and settlers have suffered so greatly from insect borne disease.

The Entomological Research Committee consists of twenty-four men of science interested in entomology and disease, with the Earl of Cromer as chairman. In common with the other members of the Committee, Lord Cromer has shown the greatest interest in the accomplishment of those objects for which the Committee was established.

In referring to the work of the Committee, Mr. Harcourt, Secretary of State for the Colonies, compares the death-rate among European officers in the West African Colonies in 1896 with that of more recent years. In 1896 this was 96 per thousand; in 1904, 28 per thousand, and in 1911, 14 per thousand.

At first the Research Committee depended upon the voluntary collections which were sent in from medical officers and others for the specimens on which their investigations were based. Later, they employed two travelling entomologists who have made entomological surveys of a large portion of Tropical Africa during the past two years, adding, by means of collections and notes, most valuable information regarding this country to the knowledge that existed previously. There have also been appointed recently several entomologists, who hold Government positions within the African tropics. These officers communicate with the Committee and benefit by being able to get specimens promptly identified, and by being in touch with a central organization where specialists have access to extensive collections and literature.

In the matter of entomological education also the Committee has been active. Three Carnegie scholarships have been assigned to entomologists for the purpose of enabling them to study methods of entomological research in America, and the application of entomological knowledge to practical affairs in that country. One of these was Mr. G. E. Bodkin, B.A., Economic Biologist, Department of Science and Agriculture, British Guiana, who has recently returned from a six-months tour of study, during which he visited those parts of the United States where large projects in entomology are being carried out; he also visited the Experiment Station at Porto Rico.

In an article which appeared in the *Times Weekly Edition* for January 3, was given a general account of the Entomological Research Committee. This article refers to the fact that the central bureau organized in England by the Committee has been housed by the hospitality of the authorities of the British Museum, South Kensington. The collections received during the first three years of work from some fifty collectors in Tropical Africa, and many in other parts of the world, amounted to 200,000 insects of which nearly 60,000 were actual or potential disease carriers. Nearly all the latter were identified and their distribution carefully studied. Many sets of these blood-sucking insects have been presented for purposes of instruction to over twenty public institutions both at home and abroad. The types of new species, and all insects of a non-economic kind have been handed over from time to time to the national collections in the British Museum.

Quite lately the Committee has assumed the title of Imperial Bureau of Entomology, and will serve the entomological needs of the whole of the British Empire, in a manner similar to that in which the Bureau of Entomology at Washington, serves those of the United States. The outstanding features of the enlarged organization as now contemplated include the following:—

(1) The organization of a system for the prompt identification of all injurious insects sent in by officers attached to Departments of Agriculture or Public Health in the British Empire.

(2) The publication of a monthly periodical which will give a brief summary of all the current literature, both British and foreign, dealing with noxious insects whether agricultural pests or disease carriers.

(3) The compilation of a card index to the literature, past and present, so that any official or student requiring information with regard to any particular pest, may be promptly supplied with all the knowledge that is available on the subject.

The development of the wider scheme in connexion with the Committee is of particular interest to the West Indies. It will be remembered that at the West Indian Agricultural Conference held at Trinidad in January 1912, Mr. Guy A. K. Marshall, Scientific Secretary to the Research Committee, who was one of the delegates at the Conference, explained the functions of the Committee and showed how it was proposed to develop and expand the work. He stated that the self-governing Dominions and Colonies and certain Crown Colonies not originally included in the scheme were interested, and he enquired whether the West Indian Colonies would join in the movement and contribute to its support a sum sufficient to cover the cost of the extra work likely to be necessary on their behalf. This arrangement has now been made by the several West Indian Colonies.

The Committee proposes to issue the monthly publication referred to above, and it is hoped that Government Entomologists in all parts of the British Empire will submit brief reports at short intervals indicating the main features of current work.

It will thus be seen that the Entomological Research Committee has maintained a steady and satisfactory growth, and that it promises even more for the future than has been accomplished in the past. Its increased facilities for work and the inclusion of the West Indies within the scope of its activities give an added interest in its future development to all who live and work in this part of the world; whilst its past record in connexion with the improved knowledge, which has done so much to make certain parts of Tropical Africa habitable to Europeans, indicates that it is deserving of all the credit and recognition which it is at present receiving.

WATTLE BARK.

II.

The last issue of the *Agricultural News* contained the first of three articles on Wattle Bark that it is intended to publish. The subject is now continued as follows.

CULTIVATION. It is stated (*Agric. Journ. Union of South Africa*, IV, 5, 667) that the black wattle needs a well-chosen site and careful cultivation, together with a good rainfall and a loose, deep soil. In another instance (*Agric. Journ. Cape of Good Hope*, XXV, 3, 277) it is shown by experiment that the plant will grow in soils that are deficient in plant food, provided that they are moist and open.

Whether the plants are raised from seed and then transplanted, or sown *in situ* (mixed with a quantity of sand, as they are small), according to *Bull. Imp. Inst*, VI, 158, the trees should eventually stand 6 feet apart in rows 12 feet from one another. The same authority states that two rows of maize are frequently grown between each two rows of the plants, to afford a return while they are maturing. The black wattle is described as growing quickly, attaining a height of 25 to 30 feet in four years. 'The foliage is luxuriant and affords excellent shade for animals or for low-growing crops. Practically no attention is given to the trees themselves, for if they have been properly distributed, pruning is unnecessary and several crops of wattles may be taken off the same soil without rendering it unsuitable for their further cultivation.' As the wattles are leguminous plants they actually enrich the soil in nitrogen. Fire is one of the chief enemies of the wattle grower, and fire 'breaks' are often made, where the plantations are in prairie land, by ploughing broad strips around them.

STRIPPING AND PREPARATION OF BARK. The authority just quoted states that the trees reach their prime in about ten years after they are sown, though trees are often considered to be fit for stripping when they are seven, or even five years old. The rate of growth is dependent upon the soil and locality, as well as on individual variations in the seed. For stripping, a cut is first made either 3 or 4 feet above the ground, or as near to the roots as possible. In the first case the bark is pulled off downwards, and thus includes much of the covering of the upper roots which is often the richest in tannin; in the second case, the bark is stripped upwards, as far as the bases of the lower branches. Successive sheets are removed, until the trunk is quite bare; then the tree is felled, in order to enable the bark to be stripped from the parts between the branches. A stripping machine has been invented, which is claimed to be successful.

The bark is dried by hanging the long strips over poles, in drying sheds; the process usually takes several weeks. Artificial heat is sometimes employed for the purpose, but requires care, or tannin is lost. The dry bark is usually cut in a mill into pieces about 2 inches long and 1 inch wide, and exported in sacks.

After the plantation is cleared, seedlings usually spring up and have to be thinned out to the right proportion. There is generally no need, therefore, for replanting.

It should be mentioned that the fear of possible over-production of the bark, and the consequent fall in prices, have led wattle growers in Natal to enquire into the feasibility of exporting the extract instead of the bark. In one of the publications (*Natal Agric. Journ.*, XI, 5, 595) dealing with the subject, the opinions of the principal handlers of the bark from Natal are given, in connexion with the matter. It may be said shortly that these were adverse to the proposal to extract and ship tannic acid from the bark, mainly for the following reasons: (1) the comparatively high tannin content of the bark, in relation to that of the extract reduces greatly any possible saving on freight; (2) the extract is not suitable for the kind of tanning employed, which is done in pits with the bark itself; (3) Germany, one of the largest customers, puts a duty on solid extracts, but not on barks used for tanning; (4) the idea of over-production is erroneous: a much larger output would put much of the bark in the place of quebracho wood, which cannot bear any lowering of prices. Further information (in *Bull. Imp. Inst.*, VI, 2, 170) refers to the manufacture of a fluid extract from the branch-bark, and experiments for making it from the leaves, in Australia, and to the possible employment of central extract factories.

YIELD OF TANNIN. The issue of the *Bulletin of the Imperial Institute* mentioned above gives a table compiled from results (in *Journ. Soc. Chem. Ind.*, 1902, 21, 159) which show, among others, that golden wattle 'No 1, special' and golden wattle 'No. 2, ordinary', from South Australia, contained respectively 49·5 and 40·2 per cent. of tannin; while black wattle from an unknown source gave 38·3 per cent. In *Agric. Journ. Union of South Africa*, IV, 5, 667, the black and green wattles are stated to contain about the same percentage of tannin, but the former is considered to give the greater yield of bark per acre. As regards comparison of the black and golden wattles, it may be said that, whilst the latter is richer in tannin, the former is hardier and, again, more productive of bark. In a general way, relating to the subject of the tannin content of different wattles, attention is drawn to a useful article in *Bull. Bur. Agric. Intell.*, 1911, 2, 340.

In the *Natal Agric. Journ.*, XI, 5, 603, the question is considered as to the profitableness of barking trees before they are six to ten years old. The results of analyses conducted on material from trees two and three years old show that no great modification of the present system can be recommended. In *Bull. Imp. Inst*, VI, 2, 160, it was stated that investigations were to be made to see if the season of stripping influences the tannin content.

The third, and last, of this series of articles on wattle bark will appear in the next issue of the *Agricultural News*.

Lecturing on 'The Moon' at Queen's College, London, Professor R. A. Gregory said investigations had shown that air tides were produced by the moon, but they only caused a difference of one-fiftieth of an inch in the height of the mercury in a barometer, and were of no value in practical weather-forecasting. Systematic inquiries had failed to reveal any useful rule connecting the moon with the weather. (The *Tropical Agriculturist* December 1912, from the *Daily Mail.*)

GLEANINGS.

Accompanying the Trinidad and Tobago Colonial Report for 1911-12 is a useful map of the Colony showing roads, railways, coast steamer routes, water-supplies and the different crop districts.

It is stated in the *Journal of the Royal Society of Arts*, for January 24, 1913, that the price charged in Italy for irrigation by the Canal Cavour during the summer, was at the rate of £92 per Italian *modulo* (that is a discharge of 22 gallons per second).

A statement made in the *Journal of the New Zealand Department of Agriculture* shows, that in Brazil, for over twenty years, the inhabitants have made banana flour and banana cloth; whilst the lace made from the fibre of the banana tree (from which the cloth is also made) is sold locally for 6*d.* a foot.

It is reported in *The Board of Trade Journal*, for January 23, 1913 that during the week ended January 16, 1913, there were imported into the United Kingdom, 75,136 bales of cotton, including 162 bales of British West Indian, 23 bales of British West African and 1,092 bales of British East African.

During the fiscal year 1912, the Bureau of Soils, United States Department of Agriculture, performed 451 square miles of detailed soil survey work in Louisiana bringing the total survey work done by the Bureau in the State to 9,210 square miles (From the *Modern Sugar Planter*, January 25, 1913.)

The year 1911 proved to be unique in the annals of the Siam rice trade, both on account of the paucity of the crop and the unprecedented fluctuation in prices. For the first time for many years, rice had to be imported into Siam from Rangoon. (From *Diplomatic and Consular Reports*, No. 5034 Annual Series.)

In the *Monthly Bulletin of the Bureau of Economic and Social Intelligence* for November 1912, it is stated that Canada possesses what is probably a more complex system for the inspection, grading and sale of grain than any other country. By this system, the law establishes certain standards in accordance with which the grain is bought and sold from the time it leaves the farmer's waggon until it reaches its destination

According to the *Planters' Chronicle* for December 28, 1912, a demonstration, in London, of cookery by sound, has revolutionized the ordinary method of roasting coffee. The idea is that by turning the handle of the new machine at a certain speed the beans are thrown into the air; the heat passes through, causing the emission of certain sounds at different stages, and the coffee is quickly roasted in suspension.

A copy of the Dominica rainfall returns, 1912, shows that the mean precipitation for thirty four stations for the year was 98·91 inches. Of these stations, twelve, situated on the leeward coast, show a mean return of 65·75 inches; six La Soye coast stations, 79·19 inches; three windward coast stations 95·94 inches, whilst the mean return for thirteen inland stations was 135·71 inches. The lowest precipitation, 38·17 inches, occurred at Batalie; the highest return was 200·01 inches of rain which fell at Gleau Manioc

A notice in the *United Empire*, for January 1913, refers to Prinsen Geerligs's new book on the World's Cane Sugar Industry as being in every respect an admirable treatise which will not only be particularly useful to all who are practically engaged in the cane sugar industry, but will also be of special interest to the general reader who wishes to learn something of an industry that has been the victim of more ups and downs than any other. A large section is devoted to the West Indian islands. The work will shortly be reviewed in the *Agricultural News.*

The following conclusions are given in the *Experiment Station Record* for September 1912, in connexion with recent work on nitrogen assimilation, under sterile conditions of plants, from nitrates, ammonium salts, and asparagin: 'In the plant tissues the nitrates are reduced to ammonia during the oxidation of carbohydrates. The ammonia so produced takes on the forms of various amide compounds, in some parts, of asparagin; whilst ammonium salts absorbed from outside pass over in large part into asparagin. Asparagin is absorbed by the plant and appeared to be a good source of nitrogen.'

In the *Bulletin of Agricultural Statistics* for December 1912, it is stated that in the recent Egyptian cotton crop the first picking was abnormally large, especially in Lower Egypt, and that subsequent pickings have not yielded as well as was at one time expected. The attacks of the boll worm have been severe in some districts, but have not materially affected the yield. As was anticipated the third picking was not satisfactory, and the total yield, particularly in Lower Egypt, will be less than was predicted some time ago. (See also *Agricultural News*, January 18, p. 28.)

An abstract appears in the *Experiment Station Record* for September 1912 (Vol. XXVII, p. 324) of a paper describing an investigation in which rape plants were grown in sterile sand practically free from potash, some of the plants receiving no potash, while in other cases a 2 per cent. solution of potassium sulphate was painted on the leaves from time to time, but no potash was given for the roots. A a result, practically no growth was made by the plants in sterile sand which remained untreated; whilst the others, receiving the potash through the leaves, made normal growth and came to maturity.

STUDENTS' CORNER.

MARCH.

First Period.

Seasonal Notes.

The cotton crop will now soon be over and the bushes will have to be buried under or burnt. 'Ratooning' is not to be recommended. How long will the land lie fallow before being replanted? In the meanwhile the selection of seed should receive attention. It would be worth while to observe the occurrence of any five-loc bolls in the field and to collect seed from such bolls with a view to planting at least some of it, if found, in a small plot immediately. Seed which is saved in the ordinary way from this year's crop must be stored in places free from damp and disease. Seed which is obtained for planting purposes, from other estates should be disinfected, unless there is good reason to believe that it has been carefully selected from healthy plants.

In places where the grafting of cacao is going on, great care is required in keeping the pots well watered. The dry season is the time to undertake the annual sanitation of the cacao orchards. All dead wood should be removed. Wounds should be treated by painting over first with Bordeaux mixture followed by tar or some other antiseptic. How would you deal with diseased pods and other infectious material removed from the trees?

In those districts where onions are grown, the harvesting will soon be over. Now is the time to get practical experience in curing and packing for market. State the reason why onions cannot as a rule, be stored for any length of time, in the West Indies. What precautions should be taken in the drying of the bulbs?

The substance tannin was referred to in the questions to these notes in the last issue of the *Agricultural News*, and the student will have obtained good practical knowledge on the subject by reading the articles dealing with wattle bark and the artificial ripening of bitter fruits, published in the same number. The economic importance of utilizing locally occurring substances for manurial purposes has frequently been dealt with in this journal, and in the last issue a good lesson is contained in the account of the manurial practices that are followed in Southern India. The matter is dealt with, in a wider sense, in the article entitled Recent Publications on Soil Fertility in this or the succeeding number of this journal.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Write a short description of a new method of mechanical analysis of the soil.

(2) Give an account of any cases where the application of chemical substances to the leaves of plants is likely to produce a beneficial effect.

INTERMEDIATE QUESTIONS.

(1) What are the more important characters of a seedling cane?

(2) Has tapping any effect upon the composition of rubber?

FINAL QUESTIONS.

(1) What are the chief leguminous crops grown in your district as green dressings? Discuss, as well as the matter will allow of, what the cost per acre is for some particular crop under certain conditions, and state the benefit derived from its cultivation.

(2) Write a short account of either (a) sugar and cotton prices, or (b) lime-juice and cacao prices, during 1912-13.

SILK PRODUCTION IN FRANCE.

An abstract in the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for October 1912 deals with methods that are suggested for putting an end to the decline that is taking place slowly in silk production in France. It commences with a table which shows that the number of breeders of silkworms and the number of fresh cocoons produced annually in that country have decreased from 200,538 and 21,716,455 lb. in 1872 to averages of 120,732 and 16,342,572 lb. for the years 1906-10. At the same time the yield of cocoons per ounce of eggs has almost doubled, since 1852. The prices have in the meanwhile decreased very little, in spite of the competition of the Far East.

A study of the statistics demonstrates that the lessened production has been caused by a cessation of silkworm-breeding on a large scale, as far as the years preceding 1890 are concerned; since that time the number of small breeders has decreased. Since 1900, breeders have generally diminished their output. The abandonment of the industry on the large scale cannot be attributed to fall in prices, since these have remained almost at the same level, as has been said; nor to the increased cost of labour, for this has been more than made up by the higher yields. The true cause seems to be found in the opinion, gradually adopted, that the conduct of the industry on a large scale was doomed to failure, and in the present justifiable attention, that is being given to vine-growing.

It is thought that the idea concerning the unsuccessful nature of large silkworm establishments has no foundation in fact, and it is claimed further that the opinion is contradicted by experience. To increase the chances of the success of these, the number of attendants should be greater, and a profit-sharing scheme should be adopted, of the kind followed by many large owners in Italy and by all those who produce silkworm eggs in that country and in France.

Attention is paid in the paper to the disastrous results that are likely to follow the want of diversification of agricultural industry entailed in cultivation almost restricted to one crop, like the vine, and it is suggested that these should be brought forward with emphasis, as a means of resuscitating silkworm-rearing on the large scale. At the same time, the small breeder should be helped to obtain results that will make the industry more popular, and this may be done, it is thought, by proper instruction in silkworm-rearing; this should be given in the schools, as well as by means of stationary or travelling demonstration silkworm nurseries and experiment plots for mulberry cultivation.

The paper concludes with other, more special suggestions, including the creation of a central service of sericulture, or at least an inspectorate authorized to adopt means to encourage the industry, especially as a concomitant with vine-growing.

A consignment of a new fruit has been received at Covent Garden. It is called Jamra, and both in shape and size is like an ordinary pear, but is blood red in colour. Specimens were sold yesterday at one guinea each. (*The Times*, November 12.)

FUNGUS NOTES.

MISCELLANEOUS ENTOMOGENOUS FUNGI.

In the *Kew Bulletin*, No. 8, 1912, p. 358 appears an account by Massee of a new species of Isaria, found by Mr. W. H. Patterson, on the Gold Coast, as a parasite of the green plant bug (*Nezara viridula*). This new species has been named *I. Pattersonii*. In the paragraph following the technical description, Massee writes as follows: 'As a rule the insect is completely covered with a downy or minutely velvety nap, from which spring numerous, more or less erect, variously divided branches, bearing the very minute conidia at their fimbriate tips. The interior of the scale (i.e. of the green plant bug) is completely filled with a white stroma formed of densely compacted hyphae. From analogy, this fungus must be considered as the conidial condition of a species of Cordyceps.'

In October 1912, specimens of the same insect were forwarded from Grenada by Mr. Auchinleck, Superintendent of Agriculture, and these were parasitized by a whitish fungus. Pure cultures of this organism were obtained on nutrient agar plates, and on cylinders of steamed sweet potato on which it grows with considerable vigour. At the same time a culture in a tube of nutrient agar was sent to the Royal Botanic Gardens, Kew, and there identified by Wakefield as being the same fungus as that found on the Gold Coast, namely *Isaria Pattersonii*. Pure cultures on steamed sweet potato cylinders have been sent to Grenada for the purpose of conducting inoculation experiments, and if these are successful, it is hoped that some use may be made of it on a large scale in controlling the green plant bug, as this was reported to be doing serious injury to certain crops in the island during the exceptionally dry season experienced last year. In this connexion it is interesting to note that Mr. Sands, the Agricultural Superintendent, St. Vincent, reports the existence of a parasitic fungus on the green plant bug in the neighbourhood of the Experiment Station in that island, but the identity of this organism is not known, as no specimens have as yet been examined.

Aschersonia turbinata, to which reference was made in the *Agricultural News*, Vol. XI, p. 270 is of fairly common occurrence on the soft green scale insects, especially the mango shield scale, and with it is sometimes found another species *A. cubensis*. Yet a third species, *A. tahitensis* has been reported from certain localities in the West Indies, among them from Jamaica. It is peculiar, however, that the species parasitic on white fly, two of which have been found so useful in Florida, do not appear to occur naturally in the West Indies, as none have yet been brought to the notice of this Department. *Aschersonia aleyrodis* is reported to occur on white fly in Cuba, but it was probably imported from Florida, where it is one of the two common species.

Some interesting work on the fungus parasites of insects attacking the sugar-cane has recently been conducted by A. T. Speare in Hawaii, and an account of it is published in Bulletin No. 12 of the Pathological and Physiological Series of the Hawaiian Sugar Planters' Association. Two new species of fungi are described as parasites of the pink mealy-bug (*Pseudococcus calceolariae*) found commonly in the West Indies as well as in Hawaii on the nodes of sugar-cane when these are protected by old leaf sheaths. The first of these fungi is *Entomophthora pseudococci*, a species which, even when fruiting, is only with great difficulty distinguishable from the waxy covering of the insects unless the observer is acquainted with it. This fungus changes the characteristic pink colour of the healthy insects, to a chalky white appearance when the host is in the last stages of the disease. The body wall of the insect, usually quite flexible, is rendered so brittle that when it is touched with a pair of forceps a rupture occurs. Inoculation experiments showed clearly that the fungus is a true parasite, as might be expected from its systematic position. At times, this, with that about to be described, acts as a most efficient control of the mealy-bugs. Nothing is known of the existence of any fungus of this genus on the pink mealy-bug in the West Indies, though it is quite possible that it does occur, but has been overlooked, since it was only accidentally observed in Hawaii owing to its inconspicuous habit.

The second parasite on this insect is a species of Aspergillus, thought by Speare to be so far undescribed and named by him *A. parasiticus*. The spores of this fungus are bright green in colour and impart a bright-green mealy appearance to the bodies of the insects attacked. Inoculation experiments showed that it was a true parasite independent in its action of the Entomophthora, and that it was more virulent on the young than on the older insects. It is of considerable interest to note that an Aspergillus of much the same colour and appearance, possibly even identical, is of very common occurrence on the pink mealy-bug in the Lesser Antilles and has also been found in Porto Rico. No experiments have been conducted as yet to test the parasitism of the local species, but the work done in Hawaii renders it at least probable that the West Indian form is a parasite, in which case it must be regarded as a control on the insects capable of producing a fairly definite effect.

A third entomogenous fungus recorded on sugar-cane insects from Hawaii, is the green Muscardine (*Metarrhizium anisopliae*) best known in the West Indies in connexion with the frog-hopper in Trinidad. It was found in Hawaii on the weevil borer (*Rhabdocnemis* [Sphenophorus] *obscura*) and on the 'Japanese beetle' a hard back (*Adoretus umbrosus*); also more recently on a cane root-grub of the genus Anomala. As has been pointed out elsewhere, this fungus is of very wide geographical distribution, and occurs on a variety of insects. It does not seem to have been recently imported into Hawaii, but with the exception of Trinidad, has not been recorded naturally from the West Indian islands. Experiments have been planned to test its parasitism on two species of May bug, *Lachnosterna patruelis* in St. Kitts, and *Lachnosterna* sp. in Antigua, found in the soil at the roots of canes and probably the cause of a certain amount of damage to this crop. Experiments are also in progress in Porto Rico in connexion with another species of Lachnosterna known to be a pest of the sugar-cane.

Speare's paper concludes with a short note on a sterile species of Cordyceps found on the cane leaf hopper (*Perkinsiella saccharicida*). This was at one time quite abundant in wet regions in Hawaii, but now has become rare owing to the comparative scarcity of the host insect.

In *Colonial Reports*—Annual, No. 741, it is stated that the export of oranges from the Bahamas during 1911-12 was only 15,400 valued at £20 as against 42,130 valued at £68 in 1911. In 1907 the export was over a million and a half fruit valued at £3,000. This enormous decrease is said to be the result of the cessation of operations by the Canadian Company. The cultivation of Sea Island cotton, in the Bahamas, has, so far, not been satisfactory. Want of rain or rain at the wrong time, destructive pests, and the want of cheap ginning facilities have militated against success.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

The Report of Mr. J. R. Jackson is as follows:—

Owing to the Christmas holidays which extended one week into the new year, the review of the drug markets for the month of January will actually cover a period of only three weeks, the first auction being held on January 9, when the markets showed very little animation—the continued unsettled state of the Balkan question being partially responsible—while on the other hand, it had been anticipated that the coming into operation, with the new year, of the National Insurance Act, there would be a very large increase in the demand for drugs, which up to the present time has not by any means been realized. The following notes refer to West Indian products.

GINGER.

At the first spice auction on the 8th, the market was very quiet, 145 bags of washed rough Cochin were offered and bought in at 35*s*. per cwt. 28*s*. being paid for a few packages of wormy, 80 bags of limed Japan were sold without reserve at 23*s*. per cwt. A week later there was a very small demand at nominal rates, the bulk offered being bought in. On the 22nd some sales of washed Jamaica were made at from 58*s*. to 68*s*., common fetching 51*s*. At the last auction on the 29th, all the offerings, which consisted of 110 bags of fair bright washed rough Cochin ginger, were bought in at 38*s*. per cwt.

NUTMEGS, MACE, PIMENTO, AND ARROWROOT.

At the first auction on the 8th of the month, nutmegs were represented by 167 packages of West Indian, all of which were sold at the following rates: 66's, 6½*d*., 69's to 79's 6*d*. to 7*d*., 81's to 89's 5¾*d*. to 6*d*, 94's to 115's 5½*d*. to 6*d*., 106's to 116's 5¾*d*. to 6*d*, and 120's to 135's 5¾*d*. A week later, namely on the 15th, 229 packages of: West Indian nutmegs were brought forward and disposed of 60's to 65's fetching 7*d*. to 7½*d*., 72's to 112's 5¼*d*. to 6*d*, 114's to 140's 5½*d*. to 5¾*d*. On the 21st the offerings of West Indian were seven barrels which were all sold at rates slightly varying from the above. Again on the 29th, 98 packages of West Indian were offered and mostly sold. Mace has been in fair demand. On the 8th of the month some 26 packages of West Indian were brought forward, most of which found buyers, 2*s*. 4*d*. being paid for pale, 2*s*. to 2*s*. 3*d*. for ordinary to fair, and 1*s*. 9*d*. to 1*s*. 11*d*. for broken. A week later prices had advanced slightly, 42 packages of West Indian being sold at 2*s*. to 2*s*. 6*d*. for pale, while broken had dropped to 1*s*. 8*d*. to 1*s*. 9*d*. At the auction on the 22nd the only offerings were 80 packages of Eastern, none of which found buyers. Pimento has been in slow demand. At the auction on the 29th 118 bags were offered and bought in at 2½*d*. per lb. Arrowroot has also been inactive; fifteen cases of Natal were offered at auction on the 21st and the whole bought in at 9*d*. per lb.

SARSAPARILLA.

At the first drug auction on the 9th of the month, sarsaparilla was represented by 4 bales of grey Jamaica, 14 bales of native Jamaica, 10 of Mexican and 2 of Honduras The whole of the grey Jamaica was disposed of, 1*s*. 10*d*. per lb. being paid for ordinary part roughish, none of the other kinds found buyers. On the 23rd the offerings were grey Jamaica 15 bales and native Jamaica 5. The whole of the first named sold, fair to good fetching 1*s*. 10*d*. to 2*s*. per lb. There were no buyers for the native Jamaica

LIME JUICE, LIME OIL, KOLA AND TAMARINDS.

In the matter of lime juice prices have recently advanced from 3*d*. to 4*d*. per gallon, good fetching from 1*s*. 2*d*. to 1*s*. 3*d*. per gallon, and inferior 10*d*. At the first auction of the month, three cases of good West Indian distilled Lime oil were sold at 1*s*. 2½*d*. per lb. The quotation for hand pressed was 8*s*. At auction in the early part of the month 5*d*. per lb. was paid for 2 bags of small to medium halves of dried Jamaica kola, and at another auction 4 bags of dried West Indian fetched 4*d*. to 4¾*d*. per lb. These prices prevailed at the end of the month for dried West Indian halves, and whole nuts. There has been but little done with West Indian tamarinds, but about the middle of the month there was a fairly large consignment of black Calcutta in casks which sold at 11*s*. per cwt.

At an auction towards the end of January there was a very large supply of vanilla pods amounting to about 960 tins, 800 of which sold at a decline of 2*s*. per lb. for long, and 1*s* 6*d*. to 2*s*. for medium and short pods.

Rainfall and the Cotton Crop in St. Vincent.—The Agricultural Superintendent, St. Vincent, reports that the recent very wet weather has brought the cotton crop to an abrupt termination, and that the reaping of arrowroot has been retarded. Figures supplied by this Officer, dealing with the rainfall at the Botanic Station during 1912, show that this was only 87·11 inches, which is 18·58 inches below the average of the past nineteen years, and the lowest annual rainfall that has so far been recorded. In addition, the distribution of the rainfall throughout the island was unsatisfactory; the last three months of the year were very wet generally, and this circumstance has contributed toward the present condition of the cotton crop.

Other information from the same source shows that the year before (1911) the rainfall was much above the average. This was due primarily to the abnormal precipitation of 21·81 inches in the month of September. The last two cotton seasons have been the worst so far experienced since the cotton industry was started, one being the result of an abnormal September rainfall, and the other the result of a wet reaping season. An annual rainfall, below the average, but well distributed, seems to be best suited to the requirements of Sea Island cotton in St. Vincent.

Information has been received from St. Kitts to the effect that the Local Government will provide agricultural scholarships at the Grammar School, in the place of those given until recently by the Imperial Department of Agriculture. In the notification of this, the number of such scholarships is not stated. They are each worth £8 per annum—an amount sufficient to cover the school fees exclusive of books and club subscriptions. Each is tenable for one year, and renewable subject to a satisfactory report from the Head Master at the end of the year. To be eligible, candidates must be resident in the Presidency, not above thirteen years of age, and able to produce satisfactory certificates of industry and good conduct. At the same time, one parent must be domiciled in the Presidency, unless the case is exceptional. In granting the scholarships, preference is to be given to the sons of planters or of persons employed agriculturally.

MARKET REPORTS.

London.—The West India Committee Circular, February 11, 1913; Messrs. E. A. De Pass & Co., January 17, 1913.

Arrowroot—3⅞*d.* to 5*d.*
Balata—Sheet, 3/5 ; block, 2/3½ per lb.
Beeswax—£7 10*s.*
Cacao—Trinidad, 68/- to 80/- per cwt. ; Grenada, 63/- to 69/-; Jamaica, 58/- to 66/-.
Coffee—Jamaica, 72*s.* to 82*s.*
Copra—West Indian, £28 15*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 18*d.* to 22*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet, 47*s.* to 65*s.*
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 1/3 to 1/6; concentrated, £18 10*s.* to £20; otto of limes (hand-pressed), 9/9.
Logwood—No quotations.
Mace—2/4 to 2/9.
Nutmegs—5½*d.* to 6½*d.*
Pimento—2⅛*d.* to 2½*d.*
Rubber—Para, fine hard, 4/2¾; fine soft, 4/1; Castilloa, 3/8 per lb.
Rum—Jamaica, 2/3 to 6/.
Sugar—Crystals, 16/6 to 19/-; Muscovado, 11/- to 14/-; Syrup, 11/ to 15/6; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., February 7, 1913.

Cacao—Caracas, 14¾c. to 15c.; Grenada, 14½c. to 14⅝c; Trinidad, 14¼c. to 14¾c. per lb.; Jamaica, 12¾c. to 13½c.
Coco-nuts—Jamaica, select, $29·00 to $31·00; culls, $19·00 to $20·00; Trinidad, select, $31·00 to $32·00; culls, $19·00 to $20·00 per M.
Coffee—Jamaica, 14¾c. to 16½c. per lb.
Ginger—8¾c. to 12c. per lb.
Goat Skins—Jamaica, 48c, to 50c.; Antigua and Barbados, 44c to 46c.; St. Thomas and St. Kitts, 40c. per lb.
Grape Fruit—Jamaica, $2·52 to $3·50.
Limes—$6·00 to $7·00.
Mace—50c. to 57c. per lb.
Nutmegs—110's, 13c.
Oranges—Jamaica, no quotations.
Pimento—4c. to 4½c. per lb.
Sugar—Centrifugals, 96°, 3·48c. per lb.; Muscovados, 89°, 2·98c.; Molasses, 89°, 2·73c. per lb., all duty paid.

Trinidad,—Messrs. Gordon, Grant & Co., February 17, 1913.

Cacao—Venezuelan, $16·00 to $16·60 per fanega; Trinidad, $15·50 to $16·30 per fanega.
Coco-nut Oil—$1·13 per Imperial gallon.
Coffee—Venezuelan, 15½c. per lb.
Copra—$4·25 per 100 lb.
Dhal—No quotations.
Onions—$1·50 to $3·00 per 100 lb.
Peas, Split—$5·90 to $6·00 per bag.
Potatoes—English, $1·00 to $1·50 per 100 lb.
Rice—Yellow, $5·25 ; White, $6·75 to $7·00 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., February 22, 1913; Messrs. T. S. Garraway & Co., February 24, 1913; Messrs. Leacock & Co., February 14, 1913.

Arrowroot—$7·00 to $7·50 per 100 lb.
Cacao—$10·50 to $12·00 per 100 lb.
Coco-nuts—$24·00.
Hay—$1·50 per 100 lb.
Manures—Nitrate of soda, $75·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $85·00 per ton.
Molasses—No quotations.
Onions—$2·40 to $6·00 per 100 lb.
Peas, Split—$6·40 per bag of 210 lb.; Canada, $3·00 to $4·55 per bag of 120 lb.
Potatoes—Nova Scotia, $1·70 to $3·00 per 160 lb.
Rice—Ballam, $5·15 to $5·60 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $4·50 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, February 15, 1913; Messrs. Sandbach, Parker & Co., February 14, 1913

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	——	——
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	——
Cacao—Native	18c. per lb.	19c. per lb.
Cassava—	60c.	——
Cassava Starch—	$6·50	——
Coco-nuts—	$16 to $20 per M.	$10 to $16 per M.
Coffee—Creole	17c. per lb.	19c. per lb.
Jamaica and Rio	18c. per lb.	20½c. per lb.
Liberian	13c. per lb.	13c. per lb.
Dhal—	$3·75 to $3·90 per bag of 168 lb.	$4·25 bag of 168 lb.
Green Dhal	$5·00	——
Eddoes—	80c. to $1·32.	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	8c. to 9c. per lb.	7c. to 10c. per lb.
Peas—Split	$7·15 per bag (210 lb.)	$7·30 per bag (210 lb.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	$3·00	$3 25
Lisbon	——	——
Potatoes-Sweet, B'bados	$1·20 per bag	——
Rice—Ballam	No quotation	——
Creole	$4·75 to $5·00	$5·00
Tannias—	$1·08	——
Yams—White	$1·92	——
Buck	$1·92	——
Sugar—Dark crystals	$2·25 to $2·30	$2·50 to $2·60
Yellow	$3·00 to $3·50	$3·25 to $3·50
White	$4·00	$5·00
Molasses	$2·40 to $ 2·60	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
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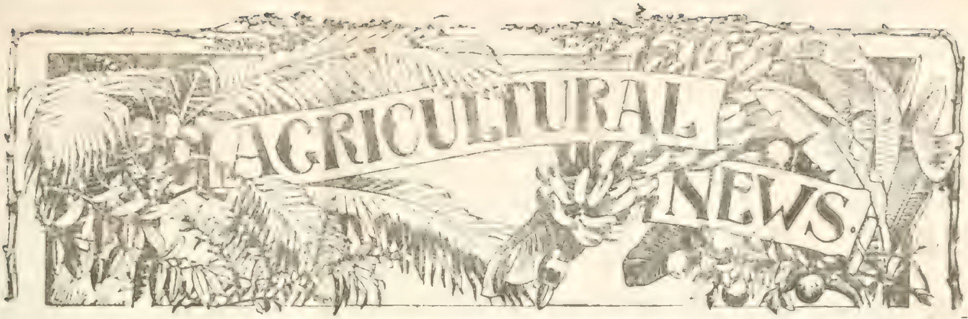

A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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A West Indian Herd Book.

IN temperate countries where the breeding of cattle is conducted in an organized manner entirely for the production of human food, it will be noticed that two distinct objects are continually kept in view. Either animals are bred for purposes of meat-production or, on the other hand, the production of milk is the primary aim. Selection and management are restricted to these two lines. Indeed so definite are the points which denote the beef and dairy animal, that modern writers on British live stock commonly employ these characteristics as a basis for the classification of the different breeds. But it was not always so. In earlier times, ox labour on arable farms in Britain took precedence over every other consideration in regard to the breeding and rearing of cattle, and selection was then as definitely directed to the production of agile, powerful and enduring animals, as to-day selection is there concerned with the eradication of such characters. Even up to the year 1880 we read that cattle were in many parts of England used chiefly for draught, and that it was only after they had discharged their functions in the field that the animals were fattened for the production of meat. William Marshall, writing in 1796, described the North Devon cattle as being somewhat below the desirable point in size for the heavier works of husbandry, but that they made up for this deficiency in exertion and agility. The Somersetshire Devon, of larger scale, formed a link between the North Devon and the Sussex breed of large and powerful oxen suited to the ploughing of the wealden clay lands. The steers of this breed were broken in at the age of two years and a half, and from the time of completing their third year were worked regularly for three or four years after which they were either fattened by the breeders or else sold to graziers. Eight to fourteen oxen were allowed to a single plough—eight oxen constituting a team, but ten to twelve being used on stiff land. The reason for employing so many was the consideration that if the oxen were worked up to their full strength, growth was impaired, and a check was put upon the disposition to fatten. Frequently the oxen were worked only on alternate days, for it soon became clear that with the increasing demand for meat, the profit on fattening was more important than the exaction of full working power. The growing population and the advent of better machinery and horse labour soon left the working ox a mere historic relic of the past. The different societies of breeders, already in existence, devoted themselves to selection for milk and beef alone, each society having its herd book of registered animals and lists of requisites of merit for admission. One of the most interesting features in the evolution of the famous beef breeds. and a feature which may yet have its parallel in the West Indies, was the improvement effected within the old working Sussex breed, by the gradual and ordinary process of selection for beef instead of selection chiefly for power and endurance of labour.

What has been said above will serve to indicate shortly the great importance attached to the selection of British working cattle previous to their falling into disuse about the end of the eighteenth century, and it points to the importance of organized breeding and registration, irrespective of what particular economic purpose may be in view. The causes which led to the disappearance of British working cattle do not concern the present considerations; but it may be remarked that had ox labour persisted in England, those breeds already referred to would in all probability have become even more specialized and remained quite distinct from the famous meat and dairy breeds of the present day.

In considering the possibility of greater specialization and organization in the selection of West Indian working cattle, it has to be admitted that the position of the stock owner in the Tropics is generally very different to that of the breeder in Great Britain. In the first place the cattle on large estates in the Tropics constitute merely a factor of production: on estates in temperate countries they yield marketable produce and hence a direct profit. This immediate return in cash has a stimulating effect and obviously justifies increased attention on the part of the owner or manager. The net advantages to be derived from a careful selection of West Indian working cattle are not so apparent, for the increase in working power and valuation of the herd are not easily measured in money. It has to be remembered too, that considerable attention is devoted to the breeding of working cattle as it is, and Zebu bulls have already been imported into many of the islands in the West Indies for the purpose of improving the indigenous races. In Jamaica and Barbados particularly is the breeding of cattle receiving increased attention. It would appear then that it is not the lack of material to work upon, nor possibly the want of individual effort that is required, but some organization which would help to direct the selection of working cattle, dairy animals and beef animals along three distinct lines and guarantee the genuineness of specially selected and pedigree animals.

It seems probable that a West Indian Herd Book would answer this purpose. It is not the object of the present article to enter into the details of such an organization, but merely to introduce the idea in a general way. It is obvious that the co-operation of the various West Indian Agricultural Societies would be a fundamental factor in the arrangement of such a scheme and there can be no doubt that the animal industry in the West Indies would be upraised by its institution.

It is perhaps in connexion with milk and meat production that benefit would be derived most quickly. It has already been pointed out that the characteristic feature of the animal industry in temperate countries is the clear line of demarcation between beef and dairy breeds. In the West Indies, apart from imported milch cows, there is no such clear distinction. Native milch cows are often used for working in the fields, and calves reared for killing or for labour may frequently have a common origin. It is true that the importance of a well bred bull is fully acknowledged in a general way, but sufficient recognition is not given to the importance of a bull of good milking strain in the breeding of dairy cows, and conversely to the importance of a cow possessing good 'beef' points in the raising of those animals which supply the community with meat. Moreover there is the purely business aspect of the matter to be considered. It has been pointed out in connexion with working cattle that the financial return for the trouble involved will appear in the form of an asset, but in the case of meat and milk production an increase in profits will show itself as surely in the West Indies as it has done in other parts of the world.

One of the chief reasons for organization in these matters is the fact that the grazing of animals and milk supply is to a large extent in the hands of the peasants. If some system of registration were established the progeny of the best animals would in the long run take the place of those of the worst, and an additional advantage would arise in that a system of registration would tend to improve matters in regard to the prevalence of hereditary diseases.

It may be put forward as an objection to any such organized scheme for selection that the climatic conditions and animal feeding in the tropics are unsuitable, that it would mean the continual importation of fresh stock and necessitate an alteration in the management of estates. But that would not be so. The object would be to select within the existing herds—not to select by means of the fortuitous crossing of worthless cows with imported bulls in a vain endeavour to raise West Indian cattle to the same standard that exists in countries which are eminently adapted for stock-breeding. It is true that some improvement in feeding and management might be desirable and in this matter the Agricultural Societies would serve a useful purpose in the dissemination of information and in the provision of veterinary assistance. Further help could be rendered by the Agricultural Societies through an introduction of the score-card system of judging into the agricultural shows.

SUGAR INDUSTRY.

THE USE OF GERMICIDES IN SUGAR FACTORIES.

The loss due to souring which may accompany the storage of molasses has already received attention in the *Agricultural News*, in Vol. VII, p. 67 and VIII, p. 257, where alcoholic and acetic fermentations are described as the result of the contamination of badly made molasses with the causative organisms. Since these bacteria and fungi, to which the trouble is due, abound in unclean places, the necessity for cleanliness in the boiling house, in gutters, in pipes and in puncheons, becomes at once obvious to all. Cleanliness, however, is not alone sufficient. Frequently germicides have to be employed, as for example, in the final washing of the molasses cistern, which should be done with bisulphite of soda or with milk of lime.

The whole question of the employment of germicides in sugar factories has recently received very thorough attention in the form of a special article by W. L. Owen in the *American Sugar Industry*, for February 1913. In this the economic advantages of their use is dealt with, and information is presented in regard to the action of the numerous germicides at present on the market. The various factors that have to be considered in the selection of these substances are dealt with first. It is pointed out that a substance which is very toxic to the human system, which can be removed only with difficulty from the tanks and apparatus in which it is used, will obviously be unsuited for sugar-house work. Bichloride of mercury is an example of such a disinfectant. Secondly, the action of the germicide on the metal of which the tanks are constructed has to be taken into consideration. Generally speaking, acid disinfectants must not be used for this purpose. Then again, the tendency of a germicide to combine with the compounds contained in the solution to be disinfected must be thought of, and it must be borne in mind that the action of some germicides is completely lost when they are applied simultaneously; thus, for example, calcium chloride and calcium bisulphite should not be allowed to come in contact on this account. Lastly, there is the relative costs to be considered, including the cost of labour required to apply the disinfectants in the factory.

The following information abstracted from the source already acknowledged, concerns the properties of certain germicides in relation to their use in sugar factories.

Ammonium fluoride, especially the acid salt, has a very wide application in distilleries on account of its strong antiseptic powers upon bacteria, and the high resistance of yeasts to it. It is not as well suited for sugar-factory work as other germicides, because it slowly attacks metal if used in sufficiently high concentrations to be effective as a germicide. Chloride of lime is very suitable for the disinfection of walls of buildings or for tanks where slime has formed.

Sulphur dioxide is used for sulphuring raw juices and for disinfecting casks. Its penetrating power, however, is not great. Carbon bisulphite is a very energetic germicide and forms an admirable agent for the treatment of tanks and apparatus. It is especially deadly to moulds. Milk of lime when freshly prepared is an excellent disinfectant for walls, ceilings and woodwork but as soon as it absorbs carbon dioxide from the air, it ceases to have any value as a germicide. A mixture of milk of lime and carbolic acid makes an excellent preparation for walls of sugar factories in the general cleaning that precedes the beginning of the grinding season. Sodium carbonate dissolved in water makes a good solution for removing the slime from pipes.

Antiformin is a preparation which contains active chlorine and not only possesses marked antiseptic powers but also greatly softens organic substances such as gums, and sediment incrustation of tanks. It thus acts as a germicide and a cleaning solution at the same time, and for this reason is a very valuable material to keep on hand. Antigermin is a germicide containing copper and is said to be of great use for cleaning down walls. Montanin is another interesting disinfectant which contains hydrofluosilic acid (as aluminium fluosilicate), and is also used for walls. The protection of walls by an application of this substance is due to the pores being sealed by the formation of calcium fluoride, alumina and silica, which imparts to the wall a hard, smooth surface. Antionin is a germicide which is used largely for moist walls in breweries, and is an excellent preventive of dry rot. Lastly, Pyricit is a new preparation consisting of a white powder soluble in water. A 2-per cent. solution is said to form a powerful disinfectant which attacks neither wood nor metal, and preserves its strength for a very long time.

The ancient ceremony, the 'Ploughing Festival' of Siam, is usually observed during the first half of the month of May. It opens the ploughing season and the beginning of rice planting, the rains having by this time sufficiently moistened the hard soil to admit of 'wet ploughing', dry ploughing, as a rule, not being practised in Siam. The ploughing ceremony is performed by the Minister of Agriculture, who acts in the place of the King. The Minister, escorted in public procession with native music and the beating of drums, proceeds to the field where mystic rites are performed. This part of the ceremony being finished, the oxen, decorated with garlands of flowers, are fastened to the plough, the first furrow of the season is made, and the early rice is sown. (From the *Journal of the Royal Society of Arts*, January 31, 1913.)

FRUITS AND FRUIT TREES.

STORAGE TEST OF FRUITS FOR TRANSPORT.

A large number of trials have again been conducted during the past year (1912) in Victoria, to test the keeping power of several varieties of grapes. An article dealing with the results obtained, appears in the *Journal of the Department of Agriculture of Victoria*, for December 1912. In this it is stated that the grapes, which were all grown in the dry Rutherglen district, without irrigation, were packed in granulated cork in ordinary export grape cases, West Australian pattern, holding 28 lb. net of fruit. They were conveyed to Melbourne in ordinary fruit trucks (not cooled) the actual transit occupying eight hours, but the total time spent in the truck was about twenty-four hours. On arrival in Melbourne the fruit was placed in the Government cool stores where it was kept at a temperature of 38°F. to 35°F., for about four months. This period served to represent the time required for shipment abroad. The cases were opened and the contents examined in the presence of several of the officers of the Agricultural Department and others interested in the shipment of grapes, and some of the more interesting results are reproduced as follows:—

'Case No. 1—*Ohanez* (white grapes). The fruit was in first class order. Practically no waste; but a few berries were slightly wrinkled.

'Case No. 2—*Valensy* (white). Very poor order, about 50 per cent. waste. The state of this case bears out last year's experience with the same grape. It is not suited for lengthy voyage.

'Mr. Grimmond's case—*Red May*. Excellent order, practically as good as Ohanéz. This grape certainly appears to be a shipper. It is a handsome bright red, somewhat oval grape, which does not detach easily, and is more juicy and of better flavour than Ohanez.

'Mr. Grimmond's case—*Grimmond's Black*. This black grape, the correct name of which is unknown, has stood the trial remarkably well. The slight muscat flavour which characterizes it when fresh had almost disappeared after cold storage. It is fairly juicy and in good order. Seeing the demand for black grapes on the English market, it is worthy of further trial.'

It may be noted in conclusion that in packing some of the cases the large bunches of grapes had been purposely broken up into smaller ones.

THE ACTION OF GRASS ON FRUIT TREES.

The Thirteenth Report of the Woburn Experimental Fruit Farm contains an account of classical research on the above subject, by The Duke of Bedford, K.G., F.R.S., and and Spencer O. Pickering, M.A., F.R.S. From this source the following information has been abstracted.

The action of grass on fruit trees is often so deleterious that it arrests all growth, and even causes the death of the tree. The action is not noticed so much when the trees become grassed over gradually during the course of several years, for under these surroundings they can apparently adapt themselves to the altering conditions and suffer much less than when the grass is actually sown over their roots.

It was thought some years ago that the action of the grass might be explained by its affecting the aeration of the soil by altering the amount of carbon-dioxide present, or by its effect on soil temperature, the moisture content or mechanical conditions. Any explanation on such grounds was found to be inadequate.

It would not be possible in the space of this article even to refer to the various ingenious experiments that were conducted in order to obtain this negative generalization. It will be sufficient to proceed at once to the biological investigation of the question which commenced with an examination of the effect on fruit trees by heating soils—partial sterilization—a subject which is dealt with fully in another article in this, or in the succeeding issue of the *Agricultural News*. Briefly, it was discovered that a toxic substance is produced by heating soils, which was found to be toxic towards the germination of seeds as well as towards the growth of plants, retarding the germination and reducing the percentage of seeds which germinate. After cultivation, however, the toxic substances become oxidized and the soil supports growth better than when not heated.

Curiously enough, soil removed from grassed ground was slightly more favourable towards germination than the tilled soil, and it absorbed water much less readily than the neighbouring tilled soil. This behaviour provided negative evidence in favour of the production of toxic substances in grassed soils; and strong evidence of a positive character was obtained later, by causing washings, from grass growing in soils on trays, to reach the tree-roots with practically no exposure to the air.

A deleterious effect was then produced nearly if not quite as great as when the grass was grown above the roots in the ordinary way.

BARBADOS: REPORT ON THE LOCAL DEPARTMENT OF AGRICULTURE, 1911-12.

Besides the ordinary text containing many interesting statements concerning agricultural practice and experiments, enlivened, in places, by a little personal advice, the sixty odd pages of this report include twenty-four tables of figures and observations, twelve pages of rainfall statistics, and an appendix. It contains, also, a special report by the Assistant Superintendent of Agriculture on the local plant pests and diseases.

To the outsider, this publication will provide information concerning those collateral sugar-cane experiments which do not come directly under the systematic selection work with seedling canes, and it will provide useful information in regard to the selection of indigenous cotton plants. Of perhaps still greater interest will be the results of investigations in economic biology, already referred to, and in mentioning this subject it may be stated that this section of the report received special attention, under the heading of Insect Notes, in a recent issue of the *Agricultural News*.

Looking at the report in greater detail one observes under the various headings certain matters that deserve special reference. Though limited in extent, the experiments designed to show the relative values of sulphate of ammonia, nitrate of lime, and nitrate of soda; the four-plot experiment to determine the probable error in sugar-cane experiments; the investigation into the supposed (now confirmed) decreased yield following the application of phosphatic manures: the work on the effect on yield caused by removing growing canes attacked by moth borer; and lastly, the demonstration of the superiority of B.147 and the degeneracy of the Bourbon variety, are suggestive lines of work of much practical importance.

In the results of the cotton-breeding experiments which follow, one indigenous variety, Grant, has already yielded 1,211 ℔. per acre of strong-fibre lint valued at 16*d*. to 17*d*. per ℔.; this variety, when crossed with the well-known Stirling, produced a hybrid that has yielded 877 ℔. of lint valued in Liverpool, at 17*d*. to 18*d*. per ℔. It is of interest to learn that the Superintendent of Agriculture considers that the best work on cotton-breeding can be accomplished only by employing the best of the indigenous or acclimatized varieties. This opinion seems to be based largely upon the experience of Indian authorities whose views are quoted in the report at some length. A useful feature of the experiments is the systematic examination of the various lints by Mr. Wolstenholme, at Liverpool. One or two of the more striking results have been noted above.

In regard to the experiments with provision crops, which next receive attention in the report, an attempt has been made to select a variety of sweet potato that can resist the attacks of the scarabee (*Cryptorhynchus batatae*), and a number of beans and peas were again grown this year, for the purpose of ascertaining whether the yield per acre of certain edible varieties—chiefly Canadian, at present imported—could be grown on a commercial scale for local consumption.

Among matters of general interest, the exhibition of produce both locally and in Canada, the fumigation of plants, arbor day, and the storage of melons at the Barbados Crystal Ice Factory, all receive careful attention in the report, on pages 41 and 42.

In conclusion, it might be pointed out that the publication under review leaves something to be desired as regards printing. Many of the blank spaces, for instance, could have been filled by a more careful re-arrangement of the subject-matter, and the selection of types for headings does not bring out to a great extent the relative importance of the different sections.

A FUNGUS DISEASE OF POULTRY.

According to an article which appears in the *Bulletin Agricole du Congo Belge*, for December 1912, a contagious disease known as thrush ('la teigne') causes very considerable loss among poultry in the Belgian Congo. The disease is due to a fungus parasite of the same family as *Trichophypton tonsurans*, which is the cause of a similar complaint in man and mammals.

The first symptoms appear on the comb and ears where white spots are produced marking the centres of mycelial development. These rapidly extend and finally unite to form large patches of yellowish-white scurf over the entire head. As the regions of the eyes and ears are attacked, the bird loses it sense of sight and hearing, and then quickly succumbs.

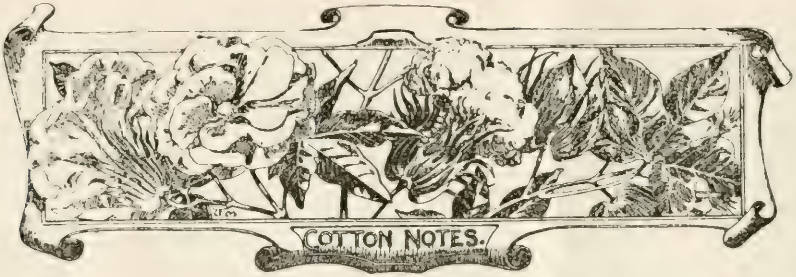
The disease is very contagious. It is therefore necessary to isolate affected subjects immediately. The diseased parts should be treated with a solution of perchloride of iron mixed with two to three times its weight of glycerine. According to another authority, a good remedy is to rub the affected parts with citric ointment or with mercuric ointment to which has been added a fifth part by weight of mercuric iodide.

The heads of birds that have died from the disease should be buried in lime or burnt.

Agricultural Show, Montserrat.—Information has lately been received from Mr. W. Robson, Curator of the Botanic Station, Montserrat, in regard to the recent Agricultural Show held there on February 26. It is stated that although the number of exhibits was not as large as in the previous year's show, the standard of quality was satisfactory and, generally speaking, the exhibition was very successful.

Minor products and vegetables were the classes most largely represented, but in many sections of these classes, the standard of excellence was very low. There were, however, very good specimens of English cabbage and egg-fruits to be seen, and the starches (under 'minor products') were as usual well represented. It is noteworthy that there was an increase in the number of exhibits of farine (a cassava meal) which is a commodity worthy of greater attention. It is a matter for some regret that the cotton and fruit classes were not better represented in Montserrat. There were 149 exhibits of vegetables, whereas only eleven specimens of cotton were shown

In conclusion Mr Robson states that the show was opened in person by His Honour the Commissioner of Montserrat (Col Davidson Houston) and that both the Commissioner and Mrs. Davidson Houston awarded prizes for industrial work.


COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date February 24, with reference to the sales of West Indian Sea Island cotton :—

Since our last report a moderate business has been done in West Indian Sea Island cotton and prices remain quite steady. The sales amount to about 220 bales including Barbados 19*d.*, Nevis 18*d.* to 19*d.*, a few Montserrat 18½*d.*, Antigua 19*d.* to 20*d.*, St Kitts 17½*d.* to 20*d.*, St Vincent 22*d.* to 23*d.* and Stains 9*d.* to 10*d.*

Holders of American Sea Islands continue to press sales and are encouraging 21*d.* for the finest crop lots. All lower qualities are very unsaleable, owing to the competition of Sakellarides.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending February 22, is as follows:—

The sales for the week consisted of the 150 bales Fully Fine and Extra Fine reported in our last and a further 50 bales of the same grades, and the following Planters' Crop Lots, viz.: the W. G. Hinson/Stiles PT. 35 bales, 30 bales of the Jos. T. Dill crop at 38c. and 30 bales Bellevue/Lawton at 31c.

There is still some inquiry for the Planters' crops, which may in time result in further sales. Otherwise the market is quiet. The offering stock of odd bags consists almost entirely of off and tinged cotton, which Factors are anxious to sell and would make some concessions to do so.

We quote, viz:

Extra Fine	28c. to 29c.	= 16*d.* to 16½*d.*	c.i.f., & 5 per cent.
Fully Fine	26c. to 27c.	= 14¾*d.* to 15¼*d.*	,, ,, ,, ,,
Fine	25c.	= 14¼*d.*	,, ,, ,, ,,
Extra Fine off in preparation	25c.	= 14¼*d.*	,, ,, ,, ,,
Fully Fine off in preparation	22c.	= 12½*d.*	,, ,, ,, ,,
Fine off in preparation	20c.	= 11½*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, to February 22, 1913, were *nil*, 353 bales, and 3,302 bales, respectively.

Parasites of the Cotton Worm.—Mr. W. I. Howell, Agricultural Instructor, Nevis, writing to the Imperial Commissioner of Agriculture, states that the pupae of the cotton worm are very heavily parasitized in that island.

The parasite, which on examination proves to be a species of the genus Chalcis, is stated to occur generally throughout the island, while in some localities the percentage of pupae attacked is stated to be as high as 75.

These notes are of interest as showing the abundance of a parasite, when as in this instance the host insect has been unusually prevalent. The cotton worm has occurred in enormous numbers in Nevis during the season now drawing to a close, and in consequence of the food thus provided, it is to be expected that the natural enemies of this pest, of which the Chalcis mentioned above is but one, would increase greatly in numbers, and as a result, the attacks of the cotton worm ought to be very much less severe next season than they have been during the present.

Branching Habits of Egyptian Cotton.—The *Experiment Station Record* for December 1912, contains an account of recent work in America on the branching habits, the location of branches and the development of fruiting branches in Egyptian cotton plants. It is pointed out that the Egyptian cotton plant bears two kinds of branches, long vegetative branches on the lower part of the stem bearing no flower buds directly, and above these shorter fruiting branches which give rise to flower buds. The vegetative branches are usually about as long as the main stem, and although they do not themselves bear flower buds, they nevertheless produce secondary fruiting branches which are about one-third as long as the vegetative branches. The fruiting branches bear a flowering bud at each node, opposite the leaf. It is stated that from six to eight large vegetative branches are usually produced from the first ten nodes of the main axis, and that at the next two or three nodes the buds frequently remain dormant or are abortive, whilst above these, a fruiting branch is produced at each node.

Everything points to an excellent cotton season in Egypt this year. One feature of interest is that the ginning factory at Suakin has been enlarged and the machinery improved, with the result that considerably more cotton was ginned and baled than ever before. Also, several steamers called at Suakin, and consignments of Tokar cotton were shipped direct at the same charge as used to be paid for shipments to Alexandria. It is probable the same thing will take place this year with the 1911-12 crop. (From *Diplomatic and Consular Reports*, No. 5026 Annual Series.)

A UNIVERSITY IN THE TROPICS.

The following article, dealing with the establishment of a tropical university, appeared in a recent issue of *The Times*. It concerns the important position of the Royal Gardens, Kew, and the Imperial Department of Agriculture, in the further development of the proposed scheme which has been already described in the *Agricultural News*, in Vol. XII, pp. 49, 59 and 72.

The authorities of the Royal Botanic Gardens at Kew have just issued 'The Kew Bulletin of Miscellaneous Information' for 1912. This volume is the latest of a series of annual issues which extends back for over a quarter of a century, and, like its predecessors, it illustrates very instructively the vast and varied services which the Royal Gardens render to the Empire as the central intelligence department of tropical agriculture and, so to speak, as the botanical clearing-house of the King's Dominions. It is perhaps a too common impression—fostered, it may be, by the rare beauty and charm of the Royal Gardens—that Kew is concerned in the main rather with horticulture than with agriculture, in its commercial and economic aspects. That is a great mistake. Kew is concerned with both, of course; for there is little that occurs in the botanical or horticultural world that does not sooner or later find its record at Kew. But it is far more intimately concerned with the commercial and economic interests of agriculture throughout the Empire, and especially in the tropics, than it is with purely horticultural interests of any kind A glance at the table of contents of any volume of the Bulletin will show this conclusively. In the present volume we have, for instance, a well-nigh exhaustive study of the sources of alcohol throughout the world; one of a series of 'Notes on Trees suitable for Experimental Forestry'; monographs on tropical and exotic plants of large and growing economic importance; a paper on the cultivation, demand for, and supply of the Fuller's Teasel; and a very striking dissertation on the prospects of the improvement of cotton by means of hybridization

These are merely a few illustrations, taken almost at random, of the scientific and practical work that is being constantly done at Kew for the promotion of the economic interests of agriculture throughout the Empire. They may well serve to give point and significance to the plea which we advanced a short time ago 'for the methodical development of the resources of the vast and potentially wealthy tropical regions' within the widespread Dominions of the Crown. In the further development of such an Imperial University or Institute of Tropical Agriculture as Mr. Norman Lamont and others interested in the subject have long advocated, it is manifest that Kew must needs take a leading part—a part to which it is abundantly entitled by the services it has long rendered, and is still continuously rendering, to the promotion of the objects in view. By reason of its extra-tropical situation it is not perhaps well qualified to be the seat of such an institute itself. 'A University of Tropical Agriculture ought obviously,' as we have said, 'to be situated where the students will live and work in tropical conditions'. But any such institution established in the tropics must, for the reasons we have given above, needs look to Kew as a central source of scientific inspiration, and also as the chief source from which its practical instructors are likely to be supplied. There are many botanical gardens and institutes scattered throughout the tropical possessions of the Crown. There is scarcely one of these which has not been indebted to Kew for the directors or other superintendents who have made them what they are. The staff of the Royal Gardens is in close and organic relation with them all. One of the most successful of them, and one which, by reason of its manifold and far-reaching activities, comes nearest to the ideal of a Tropical University of Agriculture, is the Imperial Department of Agriculture for the West Indies, which was founded by Mr. Chamberlain in 1898. It was organized on large and comprehensive lines by Sir Daniel Morris, the first Imperial Commissioner in charge of the Department; and since his retirement it has been carried on in the same spirit by Dr. Francis Watts, the present Commissioner. Sir Daniel Morris is himself a product of Kew, and was at one time Assistant Director there. His knowledge, both scientific and practical, of tropical agriculture is unrivalled, and as a representative of Kew, he has garnered it in all parts of the tropical regions of the Empire, from Ceylon to British Honduras, from the Bahamas to St. Helena.

From this point of view special interest and significance attach to a paper in the current issue of the Kew Bulletin entitled 'A Visit to the West Indies.' Since the establishment of the Imperial Department of Agriculture for the West Indies it has been the custom of the Commissioner to summon periodical agricultural conferences, which have been held in different islands of the Antilles. Last year the conference was held in January at Trinidad, and a representative of Kew was invited to attend it. With the sanction of the President of the Board of Agriculture the invitation was accepted, and Mr. A. W. Hill, the Assistant Director of Kew, was deputed to represent that department. The paper in question is Mr. Hill's report of his observations and experiences, and it bears very emphatic testimony to the scientific zeal and practical activity of the several branches of the Imperial Department which came under his observation. But we would especially direct attention to what he says of the relations of Kew to the Imperial Department and its officers. 'In most of the islands the agricultural officers have been sent out from Kew. . . . In a few cases the officers have not been trained at Kew, but my remarks apply equally to the good work they also are doing . . . I found them acting as buyers and sellers of cotton for Government, as teachers in agricultural schools, curators of gardens, devisers of experiments, agricultural instructors, &c., besides which they are expected to have an expert knowledge of botany, forestry, and many other subjects. . . . It was a matter of considerable satisfaction to find that they were fulfilling their various occupations with great credit to themselves and to the no small advantage of their respective communities.' May we not discern in this happy and fruitful association between Kew and such institutions as the Imperial Department of Agriculture the promise and the nucleus of what we desire in the Tropical University of the future?

The British Cotton Growing Association and a Tropical University.—A letter appears in *The Times* of February 14, from Mr. John W. McConnel, Vice-Chairman of the Fine Cotton Spinners' and Doublers' Association. In this it is pointed out how valuable the establishment of a University of Tropical Agriculture would be from the point of view of the development of the production of British cotton. It may be remembered that Mr. McConnel represented the British Cotton Growing Association at the last Agricultural Conference at Trinidad. His views on the subject may therefore be considered to carry double weight in that he is acquainted with both the manufacture of cotton and the local conditions of its production.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

The leading article in this number deals with the subject of A West Indian Herd Book. The matter is brought forward in a general manner and will be recurred to, from time to time, in future issues of this journal.

Page 83 contains an interesting account of the employment of germicides in sugar factories.

Under the caption fruit trees, on page 84, experiments are described on the testing of fruit for transport.

The subject of a University in the Tropics receives further consideration on page 87. The article deals principally with the existing relations in the matter, between the Royal Gardens, Kew, and the Imperial Department of Agriculture for the West Indies.

The Insect Notes, which will be found on page 90, contain an account of the lime twig borer.

On page 91 will be found an article dealing in an explanatory manner with the fermentation of cacao.

The Fungus Notes, which will be found on page 94, give important information on two local diseases.

Index to the Agricultural News.

With this number of the *Agricultural News*, is published, as a supplement, the index to Volume XI. This may be bound in the usual manner with numbers 253 to 278 of which Volume XI is comprised.

The index should prove useful for purposes of reference on all matters relating to tropical agriculture, but especially will it be of value as a guide to concise information on insect pests and fungus diseases of tropical cultivated plants.

Vegetable-growing in the Tropics.

The series of publications appearing as the *Bibliothèque d'Agriculture Coloniale* received an addition, last year, in the shape of a work dealing with the colonial, or tropical kitchen garden, the title being Le Jardin Potager aux Colonies, and the author Dr. L. Vitrac, Director of the Experiment Garden, Pointe à Pitre, Guadeloupe.

Following an introduction, the subjects dealt with comprise: general cultural conditions, composition of soil, information concerning gardens, general requirements of a good kitchen garden, preparation of garden soil, tillage and manures, vegetable seeds, times for sowing, sowing, weeding, watering, diseases of plants animals injurious to the garden, alphabetical descriptions of vegetables, and a horticultural calendar. There is no index, and although most of the matter in the book is arranged alphabetically, the usefulness of the work would be increased greatly by the inclusion of such a guide to its contents.

The whole may be said to consist of a collection of information of the greatest use to those who wish to commence, or are engaged already in, kitchen gardening. At the same time this information is presented in a way that is at once thorough and entertaining. Such a work is very greatly needed in the English islands of the West Indies, and the French Antilles are to be congratulated on their greater good fortune in its possession.

Damage to Different Crops by Hurricanes.

The unfortunate occurrence last year of a devastating storm in Jamaica, has led to the publication, in the *Journal of the Jamaica Agricultural Society*, for December 1912, of an article entitled The Storm and Crops. In this it is stated that the greatest loss to the Colony has been the widespread destruction of banana trees. In advising the repair of the damage done, it is suggested that old fields of bananas on large estates should be cut down knee-high and fresh suckers planted in between. For the small holder, who requires bananas for food and not for export, it is best to leave the battered trees as they are, for even if they give rise only to small bunches of fruit, these will be valuable for food, even though they are useless for export. Peas and beans (but not sweet potatoes and pumpkins) should be planted in between the rows.

Yams are considered to be the most important local food crop in Jamaica and the loss by the wind in this crop has been a very serious one. Yams are an expensive crop to grow, the cost of production being much greater than in the case of bananas, hence the immediate loss in actual cash to the small settler has been very great. On the other hand, the sweet potato crop was not damaged beyond recovery. Unfortunately, this crop is not grown everywhere, and certain districts have been asking for supplies of cuttings. These could be obtained, but their distribution was a matter of much difficulty, since the sweet potato cutting will not keep longer than about three days.

The corn crop, which had been in a most promising condition, was in many places completely destroyed, and there is still a shortage in the supply of seed for purposes of replanting. The reports on the extent of damage to coffee, cacao and coco-nuts have not yet been published officially.

In conclusion cocoes (*colocasia antiquorum*) are recommended as a particularly storm-resistant crop, and great emphasis is laid upon the immediate planting, after a hurricane, of peas and beans; for these plants are quick growers, soil-enriching, and the most nutritious of all vegetable foodstuffs.

A New Method of Preserving Meat.

A Belgian engineer has invented a machine which in all probability will diminish the importance of the present systems of cold storage in the preservation of large quantities of meat. The new method is described in the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for December 1912.

In this it is stated that the invention is based on the fact that when the water that enters into the composition of meat is caused to evaporate, the organic liquids are concentrated to a point at which bacteria do not develop except with great difficulty. Moreover, during the process of evaporation the meat becomes coated with a film of gelatinous matter which protects the meat from further infection.

The loss of moisture is caused to take place by means of a vacuum apparatus in which, towards the end of the operation, both low pressure and temperature act together to desiccate only the surface of the meat. After a certain quantity of water has evaporated, ozone (a form of oxygen) is admitted as a sterilizing agent.

Treatment for twenty hours causes the meat to lose about 20 per cent. of its original weight. The quantity of ammonia present (which is indicative of putrefaction) is less in the vacuum-treated meat than in ordinary fresh meat. The new process is said not to affect the composition and appearance of the meat within the protective film on the outside, and the taste is believed to be superior to that of frozen meat.

The chief advantage of the process is that the cost price of meat preserved by the vacuum method is less than that by cold-storage, because it can be treated at the centres of production.

If it is found that desiccated meat can be shipped as ordinary cargo there would appear to be some possibility of a trade becoming established in this article between South America and the West Indies, or what would be preferable, a deflection to the West Indies of some of the best Canadian beef that at present goes in large quantities to Smithfield.

Requirements of Denitrifying Bacteria.

In continuation of this subject, it is stated in the *Experiment Station Record*, Vol. XXVII, p. 424, that von Caron has recently obtained results on the special requirements of three different kinds of denitrifying bacteria, particularly in relation to food and energy, and to relative powers of utilizing atmospheric oxygen.

Dextrose has been found to be the most suitable form of energy material. Straw and trash are also good, but the fact that this material loses very readily its available carbon explains partly why the wasteful process of denitrification does not occur to any large extent in compost heaps.

The addition of nitrogenous substances to the media was found to increase denitrification: and by means of the employment of an atmosphere of hydrogen, it was shown conclusively that the exclusion of air in soils, leads to the destruction of nitrates even though other conditions may be favourable for their preservation. As regards the three different kinds of bacteria experimented with, it was established that they do not all exhibit the same degree of activity per unit of energy used, and that a solution of energy material of too high a concentration causes, as one would expect, a depression of activity; whilst an increase of alkaline carbonates in the soil may have the opposite effect.

Botanical Exploration in Bermuda.

A subject of much general interest to West Indians is dealt with in a recent number of the *Journal of the New York Botanical Garden*, namely, the origin of island vegetation. The little archipelago of Bermuda, so far separated from other land both in distance and by depth of ocean, is naturally a centre of particular interest in this respect. In his account of the flora of Bermuda, the Director-in-chief of the New York Botanical Garden presents the following results of the exploration in regard to the number and origin of the plants collected: Flowering plants, 150 species (about 10 native): ferns, 19 species (4 native): mosses, 51 species (3 native): lichens, 50 species (some 6 native); fungi, 175 species (at least 8 native); algae, 250 species (some 5 native).

In regard to the transportation of species the following information is given. All the salt-loving species and those with fruits that can retain their vitality in salt water have floated to Bermuda. These number forty-one. All the marine algae have come in the same way. Hurricanes are regarded as the chief agent in the transportation of light seeds and fruits of flowering plants and the spores of land cryptogams. In this category some eighty-three species are to be included. Migratory birds are considered responsible for the introduction of smaller seeded species other than those transported by water or wind.

What has been noted above seems to question whether the high degree of reliance that is usually placed on plant disease legislation is actually warranted. It is certain, at all events, that disease is transported by natural and often unseen agencies, as well as by means that have arisen as concomitants of modern civilization.

INSECT NOTES.

THE LIME TWIG BORER.

Towards the end of 1912, limes in a certain district in Antigua were found to be suffering from an attack of a new pest. The attack was evident from a large number of branches which had broken down and were hanging in the trees in a dry and withered condition, whilst a few of these branches were found to have been broken off completely and were lying on the ground. Examination revealed the fact that at the point of breaking each of these branches had been neatly cut nearly all round, so that, as the wood dried, a slight gust of wind would have caused it to break at the point. A search for the insect which was responsible for this damage showed that there was no tunnel or injury extending from this breaking point on the portion of the branch toward the tree itself; but in every instance the portion which had broken down or fallen off was found to be more or less tunnelled, and in many instances a borer beetle larva was discovered in the tunnels. Specimens of the adult, which is a small longicorn beetle, have been reared from the larvae, and they have now been identified through the courtesy of Mr. Guy A. K. Marshall, Scientific Secretary to the Imperial Bureau of Entomology, who states that the technical name of this insect is *Elaphidion mite*, Newman, and that there are specimens of it in the British Museum from St. Thomas, St. Bartholomew, St. Kitts and Guadeloupe.

This insect was found to occur in two localities in Antigua at nearly opposite sides of the island. At that time it was supposed to be a local pest. From the information now at hand, however, it appears to be of fairly general distribution throughout the Leeward Islands.

The following information is taken from a report on a visit to Antigua in December 1912, by Mr. H. A Ballou, M.Sc., Entomologist on the Staff of the Imperial Department of Agriculture.

'The attack on a lime branch apparently always begins in a small twig; that is to say, the egg is laid on a small twig and the young grub first begins feeding in this situation. It is not possible to say whether the twig on or in which the egg is laid is dead or dying at the time of egg-laying; but in every instance of attack observed, both in the field and in specimens forwarded to this office, the small twig has been found entirely eaten out, the dead interior connecting with the tunnel in the larger branch from which the twig springs. The larger branch is always more or less girdled by the tunnel of the grub. This girdling seems to be the first thing done by the grub on reaching the larger branch, and it results in the death of the branch beyond the point of the girdle. The borer tunnel does not circle the twig in such a manner as to cut it off completely, but the direction is rather spiral so that, as the injury to the branch becomes more and more felt, the limb breaks down and is usually left hanging for some time. The entire grub and pupa stages of development are passed within this branch, the adult beetle only issuing from the dead branch some time after emerging from its pupal condition. This last statement is based on the fact that the adult beetles fully formed, and with mature colours, have been found in this situation, apparently never having been out.

'The length of the life-cycle is not known. The number of eggs laid by a single female, and the other food plants on which they are laid have also still to be learned. The life-cycle, may safely be said to be comparatively long, since specimens have been found, both larval and adult, in lime twigs which had apparently been dead for a long time, and as it seems likely from what we know that this insect begins its feeding in living wood, this would indicate a long life-cycle.

'In another locality, the same insect was found at work in a few neglected lime trees, and a grub was found in a tamarind branch which appeared, from the nature of the tunnel made, to be the same as the one in the lime trees. A piece of dead Acacia wood found at this same place had been bored and girdled in a manner very similar to the limes, and it may be that the Acacia is also a food plant of this insect. No indications of the presence of the insect were found in the other parts of the island visited.

'It is likely that the beetle has occurred as a pest of limes in Antigua for some time but has been overlooked. It is very probable that it has a considerable range of food plants from which renewed attacks on limes may be experienced from time to time. The presence of this insect, however, should not prevent the development of the lime industry in Antigua, as it ought to be a fairly easy pest to control. Within a very short time from the beginning of the attack, the grub injures the branch, in which it is to complete its development, to such an extent as to make the damage very conspicuous. First of all the leaves wilt, they then discolour and dry up; about this time the branch breaks at the point of girdling, and usually hangs in the tree, forming a very conspicuous notice of the presence of the beetle.

'The remedy to be employed is therefore obvious. Any dying branch on which the leaves are curling up or turning yellow, should be carefully examined for the presence of the borer, and if the grub can be found it may easily be dug out, or the branch may be removed sufficiently far back toward the tree to ensure the removal of the grub. It is more likely that the attacked branches will most often be detected after the breaking down has occurred, and then the point at which the branch should be cut is clearly indicated. When the branch has broken, the grub will always be found in that part of the branch beyond (or outside of) the break. If all these broken branches in which the grubs occur can be collected and burned, say at intervals of one month, it ought to be possible to reduce the numbers of this insect to such an extent that it would no longer be a pest.

'The loss of the attacked branches, in the first instance, is, of course, an important item from the lime grower's point of view; but if this system of collecting is carefully carried out there will probably be very little infested material to collect after the first two or three times, because the destruction of all the developing grubs over a period of three or four months will very largely preclude further increase and development on the part of this insect.'

It may be useful to compare briefly the habits of the lime twig borer with those of other beetles of the longicorn group which cause the breaking off of twigs and branches (the oak pruner and the twig girdlers), or which by reason of their attacks on limes (the bark borer) are of interest in this connexion.

In the case of the lime twig borer it seems to be natural for the larva to tunnel around the branch in such a manner as to cause it to break down but not to be severed. The dead wood in which the larva continues to live being thus kept off the ground, the decay of the woody tissue is less rapid than would be the case if it fell and came under the influence of the moisture of the ground in the shade of the growing trees. In other words, the larva lives on dead and dry, but not decaying, wood.

Elaphadion villosum, which occurs commonly in the United States, is called the oak pruner because it often attacks the twigs and branches of oak: it also attacks the apple. This insect differs from the lime twig borer in the important particular of the manner in which the twig is girdled.

The egg is laid in a small branch, as is that of the lime twig borer. The young larva eats out this small branch, and soon after entering the larger one, girdles it in such a manner that it breaks off and falls to the ground. The larva is in the fallen portion: this coming in contact with the moist conditions on the ground begins to decay and the larva feeds on decaying wood tissue.

In a recent number of the *Agricultural News* (see Vol. XI, p. 250) an account was given of the twig girdlers of the genus Oncideres, *O. amputator* being the West Indian form. In the case of these insects, the girdling of the twig is accomplished by the parent female beetle in such a way that the portion in which the egg is laid will fall to the ground, and the larva in this case feeds from the beginning of its life on dead and decaying woody tissue.

The lime tree bark borer (*Leptostylus praemorsus*) differs from the lime twig borer in habit and manner of attack. The twig borer, as already explained, attacks the twigs and branches of the lime, whilst the bark borer begins its attack in patches of dead bark on the main stem of the tree which are often occasioned by wounds from implements used in tillage, or by bad pruning. The larvae feeding at the junction of dead and living tissue hastens the death of the bark and soft sap wood, and, when the attacks are sufficiently severe, the entire tree is sometimes killed from a point near the level of the ground.

THE NATURE OF CACAO FERMENTATION.

Recently communicated to the Chemical Society and published in their journal for November 1912, is an important paper by Bainbridge and Davies (of Messrs. Rowntree & Co., Ltd.) entitled The Essential Oil of Cocoa.

Much of the information it contains is purely of scientific interest, but those matters dealt with, which are likely to prove useful and interesting to the cacao grower have been abstracted as follows.

The essential oil was obtained in the investigation by the distillation of cacao nibs. It possesses an intense odour of cacao, and the flavour was clearly perceptible in a dilution of 1 in 50 million parts of dilute syrup. The flavour is most nearly akin to that of coriander oil. It is pointed out that in the method of preparing cacao beans in the Tropics by fermentation and slow drying, a number of possible ethereal substances are added naturally to the crude oil. To explain this, a description is given of the different fermentation changes, as investigated by one of the authors in the West Indies.

The first runnings from the fermenting box contain alcohol, invert sugar and tartaric acid. Part of this liquor penetrates into the beans, but the shell membrane is fine enough to prevent the micro-organisms, which lead to the production of these substances, from percolating to the kernels.

During the first twenty-four hours of fermentation the temperature rises to 35°C. or 40°C., varying with the exact position of the box. Within forty-eight hours it rises to 40°C. to 45°C., and if the fermentation is continued for five or six days, the temperature will be found to rise to a maximum of 45°C. to 50°C. Higher temperatures are occasionally noted when the fermentation is continued for an exceptionally long period, for instance, ten to eleven days, as in Trinidad. In this case, however, the temperature will fall towards the close.

The bio-chemical nature of the different changes is explained as follows:

(1) A large growth of *Saccharomycetes apiculatus* ('yeast') together with small quantities of *S. anomalus*, doubtless derived from the surface of the pod husks. This stage lasts about twelve hours.

(2) As in spontaneous wine fermentation, an enormous development of true *Saccharomycetes* occurs. If the temperature rises there will be no formation of new cells after the first forty-eight hours. The alcohol produced soon arrests the growth of *S. apiculatus* and the 'wild' yeasts. A quantity of alcoholic liquor drains away.

(3) Acetic acid fermentation occurs. This is caused by *Bacillus aceti* brought in great numbers by swarms of the 'vinegar fly' (Drosophila). If the temperature does not rise above 50° C., the acetic bacteria continue to grow during the remainder of the fermentation.

(4) Finally, if the fermentation is prolonged beyond eight days a growth of spore-bearing bacilli of the *Bacillus subtilis* type will take place.

In continuation the authors state: 'It is obvious that a number of the products resulting from these complex fermentations will percolate into the bean, and of these the less volatile constituents will remain on the dry kernel. Consequently we shall expect to find that the true essential oil of cocoa is accompanied by a certain number of esters and higher alcohols, analogous to those produced in other spontaneous fruit fermentations taking place at comparatively high temperatures in presence of a free supply of air.'

After describing the chemical and physical properties of the essential oil and other volatile products of cacao, the paper concludes with a summary, part of which is reproduced as follows:—

'(1) The aromatic principle of the cocoa bean is an essential oil. (2) Two thousand kilos. of cocoa nibs (deprived of some cocoa butter) gave a yield of 24cc. of purified oil with a very powerful aroma and flavour of cocoa. (3) The oil was fractionally distilled three times and the third distillation yielded seven fractions. (4) The early fractions were rich in esters, derived in all probability from the fermentation of the cocoa bean. (5) The middle fractions were rich in *d*-linalool, corresponding closely with coriandrol. The total linalool represents more than 50 per cent. of the cocoa oil.'

Co-operation in St. Vincent: Report on the Agricultural Bank.—A copy of the Annual Report of the Board of Directors of the St. Vincent Agricultural Credit and Loan Bank, Ltd., has lately been received from His Honour the Administrator of St. Vincent. The Company is incorporated under the Companies Act and appears to be in a very flourishing condition. Owing to demands from shareholders for loans, the management deemed it expedient to borrow $400. Notice of this was given in the local papers in the month of May. The amount was immediately subscribed and on December 31, $200 of the amount had been repaid. As an outcome of the support of His Honour the Administrator and of the Imperial Commissioner of Agriculture, a further loan of $960 was obtained from the British Cotton Growing Association for five years at 3 per cent. per annum. The balance sheet for the past year shows new creditors, and records general progress. The bank's accounts, by the courtesy of the Government, have been examined by the Official Accountant. After making provision for transferring $200 to the reserve fund, the Board have recommended that a dividend of 6 per cent. be declared on the invested shares.

GLEANINGS.

A successful Agricultural Show was held at Antigua on February 20. The exhibits numbered approximately 1,600.

The *India Rubber World,* for February 1, 1913, refers to Mr. H. A. Wickham as the 'father of rubber plantations.' It may be remembered that Mr. Wickham was the first man to collect, in 1876, Hevea seeds along the Amazon, and to ship them to Kew for plantation purposes.

The Curator of the Botanic Gardens, Dominica, states in a recent communication that the distribution of plants from the Botanic Station during February has been as follows: limes 1,862, Para rubber 50, grafted mangoes 3, miscellaneous plants 66. This makes a total of 1,981 plants.

Information received from the Curator of the Botanic Station, Antigua, shows that during February, the distribution of plants has been an important feature of the work in the gardens. There were distributed during the month 26,350 cane cuttings, 493 miscellaneous plants, 443 coconuts, 200 lime plants, 29 tree-seedlings and 650 tree-cuttings.

The rubber exports from the Federated Malay States have increased from 17,547,471lb. for the period January to November 1911, to 31,024,086lb. for a similar time in 1912. During November 1911, 2,104,317lb. of rubber were exported, during November 1912 the amount shipped was 3,111,473lb. (From *The Board of Trade Journal*, for January 1913.)

Circular No. 108, received from the United States Department of Agriculture, contains abstracts from the Proceedings of the Association of Official Agricultural Chemists, 1912. It contains important resolutions of interest in the West Indies, concerning analytical methods in the chemical examination of insecticides, water, foodstuffs, sugar, molasses, spices, and cacao.

In a communication received from the Curator of the Botanic Station, Montserrat, it is stated that the cotton crop is now practically finished and that much better reports are being received on this year's shipments. About 40 acres of cotton were planted in the middle of the island in January and February. The destruction of old plants is being carried out as quickly as possible.

An announcement appears in the *Dominica Chronicle*, for February 15, regarding the newly established Government scholarships at the Grammar School. Candidates must be over fourteen years of age and the syllabus of the examination is based on the usual English subjects taught in the elementary schools. The scholarships are competitive and are tenable for three years, or during good conduct.

Rice cultivation continues to receive attention in the Argentine. The grain produced is said to be too soft, though lately there have been signs of improvement, the outcome, it is thought, of the efforts of the Agricultural Department who have encouraged the exhibition of both shelled and unshelled rice at the agricultural shows at Buenos Ayres. (From *Diplomatic and Consular Reports*, No. 5029, Annual Series.)

In the *Colonial Reports—Annual*, 1911-12, No. 743, it is stated that the year under review has been remarkable, in Uganda, for the great increase in the number of European plantations. It is pointed out that although plantation crops do not at present figure very largely in the exports they will probably do so in the near future. The acreage under coffee is rapidly being extended. A large amount of land is also being planted in rubber and, to a less extent, in cacao.

Following the loss of cattle which had been fed upon sorghum, experiments have been carried out in Uruguay, to determine the hydrocyanic acid (prussic acid) content of different varieties of this plant at various stages in its development. All three varieties were found to contain hydrocyanic acid during the growing period. The content diminished with the growth of the plants, and no prussic acid was found in the seeds. (From the *Experiment Station Record*, for July 1912.)

According to the *Financier* and *Bullionist*, for January 27, 1913, a company called the West India Copra and Produce Estates, Limited, has been founded to acquire and to deal in estates in present bearing, producing coco-nuts, cacao and other tropical products. The company will act as commercial agents, manage and inspect plantations, in fact, carry on the usual business of a tropical plantation company. The directors have already entered into contracts for the acquisition of three freehold estates in Tobago.

The *Modern Sugar Planter* for January 25, 1913, provides information which shows that the total consumption of sugar in the United states during 1912, was 3,504,182 tons, an increase of 152,791 tons on 1911. The sugar used on which full duty was paid was 106,350 tons, and the amount of sugar on which a concession of duty was allowed was 2,608,632 tons; consumption of domestic production was 789,200 tons. Cuba contributed 1,664,863 tons, Hawaiian Islands 526,281 tons, Porto Rico 285,556 tons, Philippine Islands 131,932 tons, domestic cane 257,194 tons, domestic beet 516,851 tons, maple sugar 7,000 tons and molasses sugar 8,155 tons.

STUDENTS' CORNER.

MARCH.

FIRST PERIOD.

Seasonal Notes.

The present time is suitable for taking note of the varieties of cane that are especially adapted to the conditions in which you live. In comparing the growth of the different varieties, due regard should be had to the climatic conditions of the past season. And in this connexion it is not alone the total amount of rainfall received that must be considered, but also the distribution of this rainfall. Some varieties of cane are not only unsuitable for districts of low rainfall but also will not flourish in districts where, in spite of a high total rainfall, the precipitation is badly distributed. Shallow-rooting varieties, like B.1753, appear to be unable to grow well under these conditions, whereas a deeper rooting variety like B. 208, although requiring a larger quantity of moisture during the course of its life-history, can nevertheless tide over short periods of drought more easily than can many other canes having different characteristics.

Another important matter at this time of the year in regard to the sugar-cane, is the effect of the juice from bored cane upon that of healthy cane in the factory. It is believed that a very small quantity of juice from cane attacked by borer and by the red rot fungus, can seriously interfere with the tempering of the juice. Those who are connected with a factory may be able to devise an experiment for obtaining definite evidence on this point, whilst all should endeavour to prevent as far as possible, diseased canes from being sent to the factory in ordinary practice.

In many places the picking and curing of cacao will be in progress. This should lend a lively interest to the article on the nature of cacao fermentation which appears in this or the succeeding issue of the *Agricultural News*. It will be learnt from this article the reason why fermentation has so much effect on the flavour of the nibs, and hence why fermentation is an important matter from the business point of view. You should always endeavour to regard natural science from the aspect of application as well as from the point of view of its value as fresh information.

The benefits to be derived from giving proper care and attention to cacao trees were dealt with in an article in the last issue of this journal, and the yields from trees nineteen to twenty-one years old were there recorded. In the current or succeeding issue, the article on the effect of grass on fruit trees should be considered in relation to cacao orchards and rubber plantations, particularly in regard to the matter of mulching and the practice of weeding around the base of the trees.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) How does milk of lime assist in clarifying cane juice? What is the result of using an excess of lime?

(2) Explain clearly, with examples, the difference between (a) sexual reproduction and vegetative reproduction; and the difference between (b) fertilization and pollination.

INTERMEDIATE QUESTIONS.

(1) Write a short account of the use of scientific names of cultivated plants, and of the scientific names of the fungi and insects by which these plants are parasitized.

(2) Give details as to the methods and cost of providing (a) a living fence (b) a living wind-break.

FINAL QUESTIONS.

(1) Describe any disinfectants you are acquainted with. How may these be employed usefully on the estate?

(2) Discuss the advantages that accrue from the taking of regular inventories, on estates. What things on the estate would you class as representing fixed capital and circulating capital, respectively?

DEPARTMENT NEWS.

Mr. A. H. Kirby, B.A., Scientific Assistant on the Staff of the Imperial Department of Agriculture, left Barbados for England on March 5, by the R.M.S. 'Magdalena', on two and half months leave of absence, previous to taking up the duties of his new appointment as Assistant Director of Agriculture in Southern Nigeria.

On the recommendation of the Imperial Commissioner of Agriculture, the Secretary of State for the Colonies has approved the acting appointment of Mr. W. R. Dunlop, as Scientific Assistant of the Imperial Department of Agriculture.

Mr. F. W. South, B.A., Mycologist to the Imperial Department of Agriculture, returned to Barbados on February 19, from Montserrat, where he had been conducting investigations in regard to root diseases in that island. Mr. South is expected to leave Barbados on March 19, *en route* for the Federated Malay States where he will assume the duties of his new appointment as Chief Agricultural Inspector.

Mr. P. T. Saunders, M.R.C.V.S., Veterinary Officer on the Staff of the Imperial Department of Agriculture, returned to Barbados on March 5, by the R.M.S. 'Magdalena' from Grenada, where he had been engaged in investigations on certain diseases of live stock. Mr. Saunders has been nominated an official delegate to the forthcoming West Indian Conference on Tuberculosis to be held at Trinidad, and he is expected to leave for that Colony on March 24.

Maximum Profit from Pen Manure.—The indifferent and careless management of pen manure means the loss of large quantities of available plant food. Liquid excrement is more valuable than solid, pound for pound. Water-tight floors and plenty of absorbents are necessary to prevent its waste. All pen manure is more valuable fresh than after storage. Leaching by rains is one great source of loss. Manure heaps loosely made and located under the eaves or on hillsides lose half of their value. Large losses of nitrogen occur by fermentation, noticeable by the smell of ammonia. This is due to organisms which require air. Packing the manure pile with a dip to the centre and keeping it soaked with water, keeps out the air and reduces fermentation. Fresh manure may be spread at once on moderately level fields. There is little loss by fermentation, and the plant food leaches into the ground. (From Bulletin No. 221, of the University of Wisconsin.)

FUNGUS NOTES.

A ROOT DISEASE OF PASPALUM DILATATUM.

In the Report on the Botanic Station, Montserrat, for 1910-11, p. 15, appears a short note on the introduction of this host plant which runs as follows: 'This Californian grass, which has been grown with remarkable results in semi-tropical countries, was introduced in July 1910. Seedlings were raised and an experimental plot formed. The growth, so far, has been more satisfactory than that of the Pennisetum, (Indian Fodder grass also recently introduced into Montserrat) but it is yet too early to say if it will ultimately prove to be a useful acquisition.'

The grass did fairly well at first, but was subsequently attacked by a root disease, which at the present time, has destroyed it. A recent examination of the diseased clumps, revealed the presence in them of a white mycelium which attacked the roots and sheathing leaf-bases in a manner strongly reminiscent of the effect produced by *Marasmius sacchari* on the sugar-cane. The leaf bases were cemented together in the way so familiar to cane planters by a waxy white mycelium easily visible on the outside of the base of each shoot, whilst numbers of the roots were dead and dry. The fungus appeared to grow right through the compact leaf-sheaths, and may even have penetrated the growing point. In any case the ultimate result was that the whole shoot dried up. In each clump either all or the majority of the shoots were dead. On breaking up the clumps the fructifications of two or three rather small agarics were found, attached to the decaying leaves near the moist centre of the clump. One of these was a very small Marasmius with a delicate white cap and thin black wiry stalk; another, which was apparently a species of Crepidotus, had a resupinate thin pileus, attached to the substratum excentrically, and from this excentric point the gills radiated. The pileus averaged about 2 mm. in diameter, was often kidney-shaped, and in some cases provided with a very short stalk which bent over from the substratum to the point from which the gills radiated. The outside of the cap was white and the inside and gills pink.

It was not possible to determine if any of the fructifications observed belonged to the mycelium causing the damage. The grass has been taken up and destroyed, as it is unlikely to prove of much economic importance in Montserrat when liable to a disease of this nature.

A LEAF SPOT OF EUCALYPTUS PULVERULENTA.

A young tree of this species growing in the Botanic Gardens, Montserrat, showed on its leaves the presence of numerous spots, which at the time of the examination were particularly noticeable on the leaves attached to the lower branches, and on the older leaves of the upper branches; whilst on a young shoot arising on the side of, and above, the infected portions, the foliage was quite healthy. The general appearance rather suggested that the infection was rain-borne.

The spots themselves are first visible as irregular areas 1 to 3 mm. in diameter of a colour rather paler than the general green of the rest of the leaf. As they increase in size they become slightly brownish in colour or may present a water-soaked appearance near the centre of the upper surface of the leaf, whilst on the under surface the same part is almost always water-soaked. When the spots reach a size of about 5 to 6 mm. in diameter, the central portion dries out and becomes grey brown in colour. This drying continues indefinitely as the margin of the diseased area advances into the healthy tissue, so that eventually large patches are formed consisting of grey brown dry tissues bordered by a somewhat indefinite water-soaked margin about 2 mm. wide. Several of the spots may occur on one leaf, and may run into one another and form very large dead patches; in some cases this results in the death of the tip and the major portion of either side of the leaf, and nothing but a narrow green strip of healthy tissue is left along the mid-rib. No fungus fructifications were observed on any of the dried patches.

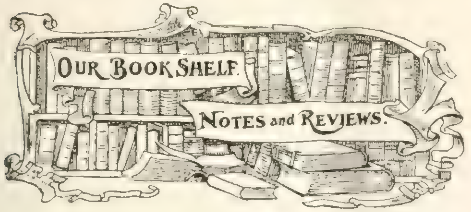
A small portion of one of these young light green spots was cut out with a scalpel and rinsed in corrosive sublimate solution 1 part in 1000 of water, then in sterilized tap water, and finally crushed in a drop of sterile tap water with a sterilized glass rod. After half an hour, two plates of nutrient agar were poured by the dilution method from this drop. In both plates a mixed growth consisting only of bacteria resulted, but there predominated certain small circular white colonies, with a smooth surface and a very definite margin, consisting of short straight rod-shaped bacteria. The occurrence of these colonies taken in connexion with the absence of fungi in the plates and of their fructifications on the spots, as well as with the appearance of the spots themselves, suggest a bacterial origin for this disease. Unfortunately, time did not allow of the carrying out of any further work to confirm this conjecture.

The disease could probably be controlled by the use of Bordeaux mixture. It is not of much importance, but is of interest as being one of the few diseases observed on the genus Eucalyptus in the West Indies.

Citrus Scab.—A description is given of this disease, due to *Cladosporium citri*, in the *Experiment Station Record*, Vol. XXVII, No. 7. The fungus has been isolated from sour orange leaves and cultivated, and infection experiments have been made demonstrating that it is the cause of the trouble described.

The organism seems particularly injurious to sour orange and lemon sprouts, and the author recommends the destruction of these, together with spraying with ammoniacal copper carbonate or Bordeaux mixture. The copper carbonate solution is preferred since it usually does not cause an increase of scale insects as sometimes follows the use of Bordeaux mixture.

Cotton anthracnose is a widespread and destructive disease in South Carolina. The disease is caused by a fungus (*Glomerella Gossypii*) which grows as a parasite in the parts of the plant and destroys the tissues. The fungus which causes the disease grows into the seeds before they are mature and remains alive there until the seeds are planted. When such diseased seeds are planted in less than three years from the time of maturity they produce diseased plants. Diseased seed is the most important factor in the spread of the disease. By careful selection, seeds which are free from anthracnose can be secured from a field where the disease is present. The fungus which causes anthracnose does not remain alive in the field for more than one year. Crop rotation and seed selection will control cotton anthracnose. (From the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases*, for December 1912.)


OUR BOOK SHELF.
NOTES and REVIEWS.

THE HUMBLE-BEE. By F. W. L. Sladen, F.E.S. *Macmillan & Co. Ltd.* Price 10*s*. net.

The book which bears the above title gives a most interesting account of careful observations in a fascinating nature study.

The author has been a student of these insects from the days of his boyhood, and his acquaintance with them is not a casual one but savours throughout the book of a friendly intimacy. As a result, his account of the life-history of the species of British humble (or bumble) bees of the genus Bombus and the parasites, or perhaps better, the usurpers of the genus Psithyrus, is a narrative full of interest to the reader and one which conveys to him a sense of the enthusiasm of the naturalist. This portion of the book comprises the first four chapters.

Humble-bees are essentially inhabitants of the north, and they flourish best at about the latitude of Great Britain. They occur abundantly in Europe, central Asia and North America, their range northwards extending to within the Arctic circle.

They are found in the Himalayas at altitudes from 2,000 to over 12,000 feet. They do not occur in the plains of India, nor in Africa except along the north coast, and Australia and New Zealand have no native species. Where they occur in the tropics they are generally confined to the mountains, although Brazil has a few indolent-looking species.

The number of distinct species of humble-bees is probably something over 100, of which seventeen are recorded as occurring in the British Isles, while the varieties or subspecies amount to over 1,000.

The humble-bees are social insects living in societies or colonies. The fertile queen survives the winter and in early spring undertakes the forming of her nest. A suitable place having been found, she proceeds to make the necessary preparations for the raising of her family, preparing it for occupancy by forming in the midst of a mass of fine dry grass or moss a small cavity, in the centre of the floor of which she fixes a small lump of pollen moistened with honey; upon this she deposits eggs in a small waxen cell. She broods over these eggs, incubating them with the heat of her body, leaving them only to collect food, part of which is eaten at the time of gathering and a part is stored in a specially constructed waxen honey pot as a supply to be drawn on during bad weather when she cannot forage.

The eggs hatch four days after they are laid; the larvae become full-grown in seven more days, and they then pupate, and in another eleven or twelve days emerge the first perfect insects of the new brood. During all this time, twenty-two or twenty-three days in favourable weather, the queen has had to work alone, building the nest, hatching the eggs and collecting food, then keeping the larvae warm and feeding them, and later keeping the pupae warm to hasten their emergence. From this time on she has the assistance of the workers from the first lot of eggs and her function now becomes one of egg-laying almost entirely.

The account of the activities of the nest for the remaining weeks of the summer is full of interesting detail, down to the time when on the advent of the cool weather of autumn the mother queen, worn out with the arduous duties of the season, succumbs to fatigue, chill, and the inevitable result of the accomplishment of her life-work. Many queens fall victims to natural enemies and many nests fail to develop successfully. From the prosperous ones, however, are developed males and females; the latter, after mating, hibernate until the following spring: the males die on the advent of the cold weather. The account of the usurpation of the nest by the female Psithyrus is also of interest. This insect invades the Bombus nest and, after ingratiating herself with the workers, kills the queen which she finds there, and becomes the egg-laying mother of the nest, the Bombus workers rearing the Psithyrus young, as they normally rear those of their own kind. As a result of this habit, the Psithyrus bees do not include workers among their castes, the Bombus workers being relied upon to care for their young.

The Psithyrus bees and those of the Bombus group are closely related and are probably descended from a common ancestral form. The species of Psithyrus generally resemble the particular species of Bombus whose nests they invade.

Humble-bees are attacked by many enemies in addition to Psithyrus, among which perhaps the chief are mice and shrews. Other insects, mites and nematode worms also prey upon or parasitize them. Birds are not serious enemies.

Turning to the information presented regarding the domestication of the humble-bee, in chapters five to seven there are given accounts of finding and taking nests, descriptions of the houses and artificial nests which have been used in the studies of these insects, and an interesting general account of the domestication of humble-bees.

Chapters eight and nine give an account of the British species of Bombus and Psithyrus. This portion will be of the greatest interest to students of these insects, for in addition to the descriptions and tables for separating the species, there are five plates reproduced in colour from photographs from nature showing all these insects at natural size, including the males, females and workers of Bombus, and the males and females of Psithyrus. The colour plates are excellent examples of this kind of photographic reproduction.

The humble-bees are useful in connexion with the pollination of many flowers with long corolla tubes, their long tongues making it possible for them to reach the nectaries which the shorter-tongued honey bee and others could not get at, with the result that they would soon cease to visit such flowers. The author describes the honey stored by the humble-bees as being of a pleasant taste; American writers, however, do not consider the taste of the humble-bee honey of that continent as being at all pleasant.

In the West Indies the true humble-bees do not occur, or if they do, the occurrence is rare and these insects are not known as familiar objects. The large black carpenter bees of the genus Xylocopa, which are called humble bees, are solitary in habit, and differ in many important points of life-history. In the first sentence of the introduction, Mr. Sladen says: 'Everybody knows the burly good natured humble-bee.' One can only wish that this were so in the tropics, for whilst the interest of the book is bound to be felt by the reader, the study of the insects which would naturally accompany the reading would greatly increase the interest

In addition to the attractive nature of the subject matter, the book itself is worthy of mention. Printed in large clear type, on good paper, excellently illustrated and well bound in brown cloth, it is worthy of a place on the shelves of every entomologist and lover of nature.

MARKET REPORTS.

London.—The West India Committee Circular, February 25, 1913; Messrs. E. A. De Pass & Co., February 14, 1913.

Arrowroot—4½*d.* to 5*d.*
Balata—Sheet, 3/5 ; block, 2/3½ per ℔.
Beeswax—£7 10*s.* to £7 15*s.*
Cacao—Trinidad, 70/- to 81/- per cwt. ; Grenada, 64/6 to 71/-; Jamaica, 60/- to 68/-.
Coffee—Jamaica, 72*s.* to 82*s.*
Copra—West Indian, £29 per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 17½*d.* to 23*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet, 46*s.* to 63*s.*
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 1/6; concentrated, £19 10*s.* to £22; otto of limes (hand-pressed), 10/.
Logwood—No quotations.
Mace—2/4 to 2/9.
Nutmegs—5¾*d.* to 6½*d.*
Pimento—2⅛*d.* to 2⅝*d.*
Rubber—Para, fine hard, 4/-; fine soft, 3/11; Castilloa, 3/4 per ℔.
Rum—Jamaica, 2/3 to 6/.
Sugar—Crystals, 16/9 to 19/3; Muscovado, 11/- to 14/-; Syrup, 10/9 to 15/9; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., February 21, 1913.

Cacao—Caracas, 15c. to 15½c.; Grenada, 14¾c. to 15c; Trinidad, 15¾c. to 16¼c. per ℔.; Jamaica, 13c. to 13¾c.
Coco-nuts—Jamaica, select, $31·00 to $32·00; culls, $20·00 to $21·00; Trinidad, select, $32·00 to $34·00; culls, $20·00 to $21·00 per M.
Coffee—Jamaica, 13½c. to 16c. per ℔.
Ginger—8¾c. to 12c. per ℔.
Goat Skins—Jamaica, 50c.; Antigua and Barbados, 48c. to 50c.; St. Thomas and St. Kitts, 44c. to 46c. per ℔.
Grape Fruit—Jamaica, $2·75 to $3·25.
Limes—$6·00 to $6·75.
Mace—50c. to 57c. per ℔.
Nutmegs—110's, 13c.
Oranges—Jamaica, $2 00 to $2·25 per box
Pimento—4c. per ℔.
Sugar—Centrifugals, 96°, 3·45c. per ℔.; Muscovados, 89°, 2·95c.; Molasses, 89°, 2·70c. per ℔., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., March 3, 1913.

Cacao—Venezuelan, $17·00 per fanega; Trinidad, $17·00 to $17·75 per fanega.
Coco-nut Oil—$1·16 per Imperial gallon.
Coffee—Venezuelan, 15c. per ℔.
Copra—$4·25 per 100 ℔.
Dhal—No quotations.
Onions—$1·50 to $3·00 per 100 ℔.
Peas, Split—$5·90 to $6·00 per bag.
Potatoes—English, $1·50 to $2·00 per 100 ℔.
Rice—Yellow, $5·50; White, $6·75 to $7·00 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., March 8, 1913; Messrs. T. S. Garraway & Co., March 10, 1913; Messrs. Leacock & Co., February 28, 1913.

Arrowroot—$7·00 to $7·50 per 100 ℔.
Cacao—$10·50 to $12·50 per 100 ℔.
Coco-nuts—$24·00.
Hay—$1·50 per 100 ℔.
Manures—Nitrate of soda, $75·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $85·00 per ton.
Molasses—No quotations.
Onions—$1·80 to $6·00 per 100 ℔.
Peas, Split—$6·00 to $6·25 per bag of 210 ℔.; Canada, $3·00 to $4·55 per bag of 120 ℔.
Potatoes—Nova Scotia, $2·00 to $3·00 per 160 ℔.
Rice—Ballam, $5·15 to $5·30 per 190 ℔.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $4·50 per 100 ℔.

British Guiana.—Messrs. Wieting & Richter, March 1, 1913; Messrs. Sandbach, Parker & Co., February 28, 1913

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	——	——
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per ℔.	——
Cacao—Native	18c. per ℔.	19c. per ℔.
Cassava—	60c.	——
Cassava Starch—	$6·00	——
Coco-nuts—	$16 to $20 per M.	$10 to $16 per M.
Coffee—Creole	17c. per ℔.	18c. per ℔.
Jamaica and Rio	18c. per ℔.	19c. per ℔.
Liberian	13c. per ℔.	13c. per ℔.
Dhal—	$3·75 to $3·90 per bag of 168 ℔.	$4·00 bag of 168 ℔.
Green Dhal	$5·00	——
Eddoes—	72c. to $1·44.	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	7c. to 8c. per ℔.	6½c. to 8c. per ℔.
Peas—Split	$7·00 per bag (210 ℔.)	$7·30 per bag (210 ℔.)
Marseilles	——	——
Plantains—	12c. to 40c.	——
Potatoes—Nova Scotia	$2·75	$3·25
Lisbon	——	——
Potatoes-Sweet, B'bados	$1·20 per bag	——
Rice—Ballam	No quotation	——
Creole	$4·75 to $5·00	$5·00
Tannias—	$1·32	——
Yams—White	$1·92	——
Buck	$1·92	——
Sugar—Dark crystals	$2·20 to $2·25	$2·25
Yellow	$3·25 to $3·60	$3·00
White	$4·00	$5·00
Molasses	——	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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PAMPHLET SERIES.

The Pamphlets are written in a simple and popular manner and the information contained in them is especially adapted to West Indian conditions. They contain, amongst other subjects, summaries of the results of the experiment work on sugar-cane and manures, the full official reports of which have only a limited circulation. The number issued up to the present time is seventy. Those mentioned in the following list are still available: the rest are out of print.

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- in 1900. No, 3, price 2*d.*; in 1901, No. 13, price 4*d.*;
- in 1902, No. 19, price 4*d.*; in 1903, No. 26, price 4*d.*;
- in 1904, No. 32, price 4*d.*

Seedling Canes and Manurial Experiments at Barbados,
- in 1903-5, No. 40, price 6*d.*; in 1904-6, No. 44, price 6*d.*;
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- in 1908-9, No. 63, price 6*d.*; in 1909-10, No. 67, price 6*d.*

Manurial Experiments with Sugar-cane in the Leeward Islands,
- in 1902-3, No. 30. price 4*d.*; in 1903-4, No. 36, price 4*d.*;
- in 1904-5, No. 42, price 4*d.*; in 1905-6, No. 47, price 4*d.*;
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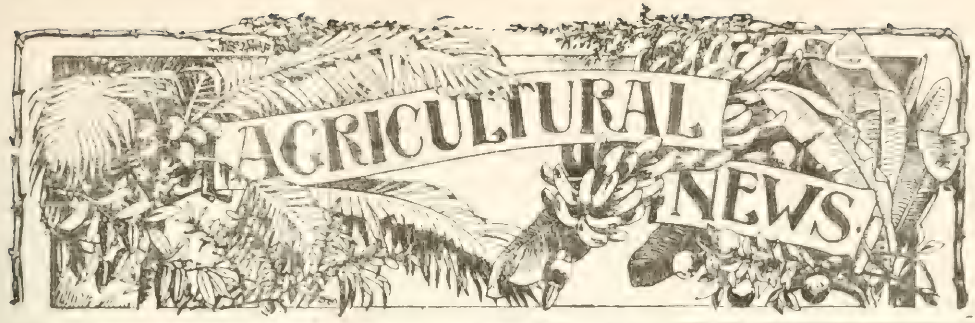

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XII. No. 285. BARBADOS, MARCH 29, 1913. PRICE 1*d*.

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The Establishment of a Tropical University.

THE favourable reception given to the idea of the establishment of a Tropical Agricultural University is evidence of the growing need that is felt for an institution capable of providing training and instruction in tropical agriculture in tropical surroundings. The trend of opinion appears to indicate that in order to be successful, the range of instruction must be very wide and at the same time attain to a high standard. It is evident that it will be necessary to go beyond the limitations of an agricultural college and afford facilities for studies of an advanced character for post graduate work, and for the training of experts in various branches of science applied to agriculture and research.

If this is to be attained it will doubtless be as the result of a process of growth: and the character of the institution in its early years will best be determined and moulded by association and co-operation with other institutions. It is hoped that, as the Tropical University will be in a position to afford instruction and training in matters that are dealt with under circumstances of some difficulty in Universities situated in temperate climates, these Universities will be desirous of establishing some connexion with the tropical institution and of providing some means whereby those students whose work involves some knowledge of tropical facts and conditions, may pursue at least part of their studies in tropical surroundings. Such an association will prove of great value in that it will serve to maintain a high standard of work and teaching, and, by ensuring a constant interchange of men and ideas between older and established institutions, it will constantly vivify the latter and tend to prevent narrowness of views and retrogressive tendencies that may be a danger that would arise from remoteness and isolation.

The second of the articles in *The Times** referring to this question of a Tropical University concludes with the following remark: 'May we not discern in this happy and fruitful association between Kew and such institutions as the Imperial Department of Agriculture the promise and the nucleus of what we desire in the Tropical University of the future.' This suggestion is a fertile one: The association of the Tropical University with Kew would be most desirable, and would, it is believed, be welcomed by that institution. The usefulness of such a course is obvious, both in matters of training and research, whilst it is felt that the work of the Imperial Department of Agriculture has largely paved the way for a Tropical Agricultural University and affords a nucleus around which it will be convenient to build. The Imperial Department of Agriculture has for some years been carrying on work of a kind that will find expression in the University, and has acquired stores of knowledge and experience that will enable work to be carried forward efficiently in the early stages and will minimize many of the difficulties incidental to pioneer work. By its association with much of the agricultural work of the West Indies, the Imperial Department of Agriculture is in touch with many problems of immediate interest which present valuable material for purposes of study and instruction and, from the fact that its range of interests embraces many islands having most diverse conditions, it will enable a wide range of subjects to be brought under the notice of students.

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* February 10, 1913.

In a small degree the Imperial Department of Agriculture has already been fulfilling some of the functions of teaching and training which it is now desired to extend and place on a more adequate footing, and it would require but a moderate amount of assistance in order to enable this Department to co-operate in carrying on the early work of the University of Tropical Agriculture whereby the foundations of an adequate institution might be laid from which vigorous and far-reaching developments would be looked for.

There would appear to be ample scope for the work of an Agricultural University in the tropics of the Western World. The interests of the West Indies, of Central and South America and of West Africa could be served by it, and as regards a location, no other place offers better advantage than the West Indies whether regarded from the point of view of accessibility or of wealth of material for purposes of teaching and study: thus we have ready to hand the nucleus and the right environment: it only remains to provide the required stimulus to start growth and development.

In supporting the suggestion appearing in *Nature*[*] that the West Indies affords a suitable site for the effort contemplated, stress may be laid upon the great interest and diversity of the industries of the region and of the conditions in which they are carried on. Most tropical industries are exemplified, including sugar, cacao, coco-nuts, rubber, cotton, fruit, spices and many other crops, whilst the surroundings in which these industries are carried on are of an extremely diversified character promoting valuable features for purposes of instruction. Owing to the extremely diverse nature of the local plant pests and diseases, around which so much attention centres in tropical agriculture, most interesting material is provided for study and training. Hence without doubt it may be said that a well equipped University of Tropical Agriculture situated in the West Indies would be capable of doing an immense amount of work in the training of agriculturists in many phases, whether they were actually employed on the land or as experts dealing with special features of agriculture, and at the same time it would be capable of undertaking research for which at present few facilities exist.

All the West Indian colonies now possess local Departments of Agriculture with their Experiment Stations; there is little prospect, however, of these becoming so equipped as to warrant their undertaking abstract investigations in agricultural subjects; their functions are likely to be limited more or less to problems of a concrete and more immediately practical character. A University of Tropical Agriculture would tend to strengthen and develop the work of the local Agricultural Departments, and could in no sense be regarded as displacing them or reducing their work and activities, for it could undertake useful investigations of a more abstract character than are appropriate to Experiment Stations—so that there would arise a useful distribution of work of investigation and co-operation between existing institutions and the one now contemplated.

As an outcome of its centralizing influence a Tropical University would play an important part in acting as a means for accumulating and storing knowledge relating to tropical agriculture ready to be drawn upon by workers in its neighbourhood and even over a wider range; it would also serve as a centre where knowledge and ideas would be grouped and co-ordinated so as to permit of the production of well considered views relating to various industries—an idea which found expression in the letter addressed to *The Times*[†] by Mr. John W. McConnel in which he pointed out how such an institution might materially advance the interests of cotton-growing by assisting to formulate knowledge for the guidance of those who are endeavouring to push cotton-growing into new districts; and we may add it would serve to train men who would be qualified to carry these ideas into practice after having acquired experience in their application. The same ideas may be employed in regard to many other industries than cotton: cacao, rubber, oils, fruits, spices, and many others present their special unsolved problems which await the students and investigators who, it is reasonable to conceive, would soon group themselves around a Tropical University.

---

[*] January 30, 1913.

[†] February 14, 1913.

In the near future the West Indies instead of constituting, as one writer has remarked, a *cul de sac* on the world's trade routes will lie across the main stream and will come more and more under public notice, so that in a short time these resources which lie undeveloped may be expected to attract the attention of those prepared to exploit them. This development will not only be greatly hastened by the existence of an institution such as the one under discussion but the development itself may be expected to derive much assistance, and gain so largely in precision, that a direct and markedly beneficial effect in the West Indies may be expected to accrue from the fulfilment of the idea.

Having regard to all the circumstances, it would appear well, in formulating proposals, to make plans for an institution endowed by funds provided by those interested in the development of various tropical agricultural industries and education, rather than to ask that the institution should be provided by the government, whether of the Colonies or of the Mother Country; though it is fair to suppose that a movement having a full measure of public support would receive material assistance from the government. It is to be hoped, therefore, that the movement, so forcibly introduced to public notice through the advocacy of *The Times*, may claim a large measure of public attention, and that it may be possible in a very short time for some concrete proposals to be formulated with a view to providing funds whereby this work may be set going.

PRIZE PASTURE COMPETITION AT ANTIGUA.

The following Report by the Judges on the results of this competition has been received recently from Mr. H. A. Tempany, B.Sc. It draws attention to the great importance of pastures in connexion with the maintenance and improvement of live stock—a matter that will receive more detailed consideration in a future issue of this journal:—

The Judges appointed by the Imperial Department of Agriculture and the Agricultural and Commercial Society in connexion with the scheme for the improvement of pasture lands in Antigua by the awarding of prizes, beg to submit the following statement of their awards together with a short report on the scheme.

1st Prize £21 (given by Colonel the Honourable R. S. Cotton) won by Gambles estate.
2nd Prize £10 10*s.* (given by Messrs. Henkell du Buissen) won by Delaps estate
3rd Prize £1 10*s.* (derived from entrance fees) won by Collins estate.
Honourable Mention: Fitches Creek estate.

In all, six pastures were entered for the competition, and each of the pastures has been visited and inspected by the judges at intervals. In making an award many points have had to be taken into consideration, and the forming of a judgment has been a matter of considerable difficulty.

In arriving at a decision, the judges have been guided by the principle laid down in the memorandum accompanying the original scheme, in which it is stated that 'at the present time there are many waste and neglected lands in the island which by care and attention might be turned into valuable pastures, and also much excellent pasture land which by careful treatment could be greatly enhanced in value: it is to endeavour to accomplish something in the direction of pasture improvement that this scheme has been formulated.'

The Judges desire to place on record that all of the pastures which they have been called on to examine evinced considerable merit, and that there is evidence in every case that care and attention have been bestowed on them; this has resulted in the marked improvement of pasture lands which in the aggregate amount to close on 300 acres; in assisting to bring about this, the scheme must be held to have been of considerable value to the island.

In Antigua the question of the provision of fodder during drought must always be regarded as likely to assume important dimensions at any time; and in endeavouring to cope with this difficulty, the careful study of methods of pasture improvement should play an important part; in this connexion attention may be directed to the need for careful study of the various pasture grasses available for choice. A further important point associated with this subject is the question of tick eradication, for with this the proper care of pastures is intimately bound up.

The Judges express the hope that the work now reported on may be the forerunner of continued effort in the same direction, which will eventually lead to a widespread appreciation of the need for pasture improvement and the benefit to the island likely to be derived therefrom.

The Report is signed by the following gentlemen, who were good enough to act as judges: Messrs. J. D. Harper, R. Warneford, Oliver Nugent, and H. A. Tempany (Superintendent of Agriculture for the Leeward Islands).

The Director of Agriculture of Nyasaland has forwarded to the Imperial Commissioner of Agriculture a publication concerning efforts that are being made to improve ploughing and general soil cultivation in that Protectorate. Reference is made to the introduction of steam and motor ploughs since in some districts difficulty is experienced in the employment of cattle owing to the presence of the tsetse fly. Attention is drawn to the importance of the proper feeding of working cattle in places where they can be employed. Figures are given showing the cost of ploughing and stumping, which, for one acre of land, amounts to approximately 10*s.*

FRUITS AND FRUIT TREES.

A NEW STOCK FOR ORANGES.

The *Revue Horticole* for August 16, 1912, ha
article describing a new stock for oranges. Th
abstracted as follows in the *Bulletin of the Burea
Agricultural Intelligence and of Plant Disease*
October 1912:—

The natives of North Africa have two manners of p
gating orange trees: in most instances they resort
sowing of a good fruit; the tree takes about fifteen ye
grow, assumes a fine shape, and generally yields good
These ungrafted orange trees were formerly fairly abu
in all the mountain ravines on the coast where irriga
easy, but fine specimens for sowing have been l
destroyed by root disease, or rot of the bark on a leve
the ground. This is a serious infection, which is very
promoted by the bad habit of guiding the water into a
at the foot of the tree

In the desert region where oranges are still grow
pagation is carried out by grafting on a slip or la
a citrus taking root easily. Unfortunately all these
stocks are sprung from *Citrus Limonum* and their res
to the foot disease is very doubtful.

In Morocco, among the Beni-Snassen another very
stock is used, the 'M'gergeb', which has generally been
for a citron tree, but which may very well be a cross
citron and the orange. This stock is resistant to th
disease, whereas the citron is lamentably deficient in that r

The 'M'gergeb' may very usefully be employed fo
ing varieties such as the Pomelos, which are too vigor
reach their full growth on the roots of Seville orang
Pomelos being on the other hand practically immune
foot disease, there would be every advantage in propa
these citrus trees, already much in demand in America,
grafting with the aid of the 'M'gergeb'. The 'M'gerg
thus also render service in the multiplication of *Citrus
ica* or Kumquat, which succeeds poorly on Seville
and which is only grafted on Triptera [*Citrus tri*
in Japan.

At the present time it would be unwise to use 'M
on clayey soils, but in light and very healthy soils,
practice of the Moroccans should form an incentive
trials. The great interest presented by this new st
in the surprising facility with which it lends itself to
gation by slips and the rapidity of the fruiting
grafted on this stock.

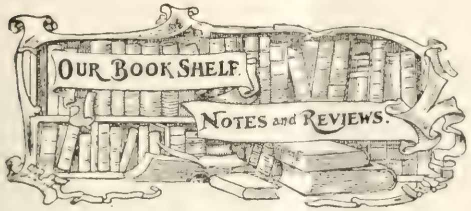
Ornamental horticulturists may, by the system of preliminary grafting of a piece of 'M'gergeb' on a branch of the mandarin tree, obtain young slip subjects raised in pots, and yielding fruit at once. The 'M'gergeb' subjects also appear very useful for receiving, in all seasons, grafts of the varieties introduced from foreign countries. The side graft almost always succeeds under these conditions.

It is difficult to fix the geographical distribution of 'M'gergeb' outside Morocco. Ferrari mentions the Canary Islands and the Azores.

The ultra-optimistic statements in connexion with the banana industry in Honduras is referred to in *Diplomatic and Consular Reports*, No. 5038, Annual Series. It is stated in this that although banana growing is certainly profitable in Honduras, as much attention and good management is required in that country as elsewhere. The banana market in the United States of America, on which Honduras depends, is carefully and effectively controlled by the United Fruit Company whose influence is a determining factor both in regard to prices on the local markets and the marketing of crops. Labour is plentiful, however, and is recruited largely in the British West Indies. The price paid is \$2 silver (3*s.* 4*d.*) per day including food. There is a fair supply of native labour at the same rate

Circulation of Starch and Water in the Sweet Potato.—It was found that the storage starch in a sweet potato plant with the normal direction of the water current is intercepted in its course by the first roots basal to the leaf from where it starts, and does not go beyond it.

The bearing of the results of these experiments on the cultivation of the sweet potato is quite evident, as they show that any portion of a many-rooted sweet potato plant may draw water from the roots most favourably situated, which are those in the main hill, so that whenever a drought occurs the rooted branches will draw water from the main hill. Every rooted joint of any branch intercepts all the starch brought from all the leaves beyond it, and allows none to pass to the main hill. In a dry time a rooted branch may feed upon the main root, but in the best growing time it does not help the crop of the main plant in the least. (From the *Experiment Station Record* for December 1912.)


OUR BOOK SHELF.
NOTES and REVIEWS.

THE WORLD'S CANE SUGAR INDUSTRY. By H. C. Prinsen Geerligs. *Norman Rodger, Manchester*, 1912.

Like other works of Mr. Prinsen Geerligs's, The World's Cane Sugar Industry is interesting, well written, and reliable. It is essentially one of those books which will find its chief use for purposes of reference, but the subject-matter is so attractively arranged and illustrated that it is a book which will entice perusal during leisure times merely for the interesting descriptions of geographical conditions in the various parts of the world where the sugar-cane flourishes.

The work is essentially geographical. It contains excellent maps of the different sugar countries of which it treats; the statistics show the number of factories, the production of sugar, its composition, and the conditions of climate; whilst the text describes the extraordinary differences in the methods of cultivation and manufacture in the various countries and gives interesting historical and economic sketches of industrial development and decline

To exemplify some of the interesting matters of which the book treats we may refer the reader to the account of the sugar industry in the Argentine where cultivation of the cane is as neglected as the factories are advanced. Going from the Argentine to Queensland, we are given a historical account of the Kanakas and White Labour question, and farther afield, in Java, the description of the sugar industry there includes the instructive story of the campaign against Sereh disease and the final selection of seedling canes which were found to be resistant to its ravages.

A considerable section of the book is devoted to the West Indies. Reference is made to the ameliorated conditions of the islands resulting from the activities of the Imperial Department of Agriculture, from the Brussels Convention and from the establishment of central factories; and in forecasting the future of the sugar industry in these Colonies, Mr. Geerligs says: 'The condition of the sugar industry in the West Indian Islands is far from brilliant, yet the feeling of despondency belongs to the past, and the efforts of the British Government to make the West Indian population contented British subjects at any cost have had satisfactory results.'

An important feature of the work is the two diagrams showing the world's production of raw sugar during 1900 and 1910. This amounted to 5,171,000 tons for 1900 and 8,563,000 tons for 1910. For the Lesser Antilles the production during 1900 was 241,000 tons; this increased to 282,000 tons in 1910. The most remarkable development has been that of Cuba, whose sugar output increased from 283,000 tons in 1900 to 1,804,000 tons in 1910.

In conclusion reference must be made to the indexes of general information and of geographical names, to the appendices, and, last but not least, to the attractiveness of the work as a well printed publication.

A HANDBOOK OF GENERAL INFORMATION ON THE VIRGIN ISLANDS. By W. C. Fishlock. Price 3*d*. net.

The intending settler or visitor to the Virgin Islands must take steamer St. Thomas, and proceed thence by sailing craft, for a distance of some 25 miles. This, however, will not defer the visits of those who may be attracted by the interesting information which Mr. Fishlock has collected in the publication under review.

Although important from an agricultural aspect, the chief value of the handbook may be said to be geographical, and it is likely to be found of some use not only in the West Indies and in Great Britain but also in other parts of the world. The subject-matter is clearly arranged in chapters which makes reference easy. The handbook is illustrated by photographs showing the natural features of the islands, including pictures of the experiment station, the sugar works and cotton factory, and a good map of the colony also finds its place at the beginning of the publication.

The Virgin Islands are interesting geographically, in that they are the most northern of the British Antilles. Lying about 60 miles to the east of Porto Rico and 25 miles from St. Thomas, the islands naturally enjoy a tropical climate and, like most of the neighbouring lands, are volcanic in origin. Some writers have described the Virgin Islands as being particularly liable to hurricanes, but Mr. Fishlock shows that this statement is not borne out by facts. An important point is brought out in this chapter on climate, namely, that although a tropical climate may have an enervating effect, the cheerful effect of sunshine and the physiological advantages of fresh air may be considered largely to counteract this influence.

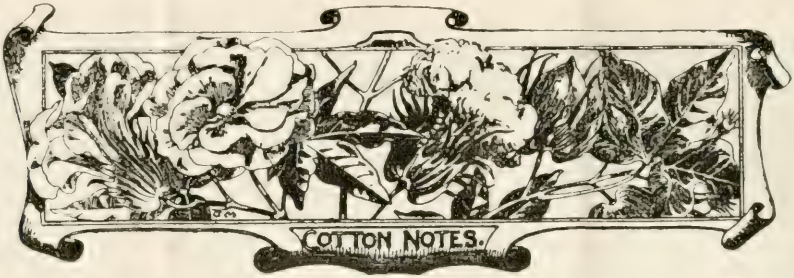
In the chapter dealing with the history of the colony it is shown that good economic progress has been made during recent years, for in 1911 the exports rose to £18,002. This, however, is a pitiful amount compared with the figures given by Bryan Edwards for 1787, when the value of the exports came to £164,128, which however must have included goods in transit and not merely the produce of the colony.

The Virgin Islands are essentially a colony of peasant proprietors. Since the organized efforts of the Imperial Department of Agriculture were instituted, the cotton industry has progressed favourably, and there are indications that lime planting may be established in the near future.

A number of interesting facts are given in this handbook concerning vital statistics, the manners, customs and religions of the people, and information is presented in regard to sports and amusements which include yachting, fishing and shooting. The naturalist is also well provided with material. The flora, fauna and geology of the islands all appear to have been neglected and would seem to furnish a good field for study.

Mr. Fishlock is to be congratulated on having presented an interesting account of a colony, which by reason of its geographical position has not been able to receive the publicity which it deserves.

It is stated in *The Board of Trade Journal* for January 30, 1913 that an advisory committee for the Imperial Institute under the Imperial Institute (Transfer) Act, 1902, has been appointed The Committee is as follows. Sir O Philipps, K C M.G , appointed by the Secretary of State for the Colonies, in place of the Right Honourable Sir Francis J. S. K. Hopwood, G.C.M.G , K.C.B., resigned; and the Hon. Thomas Mackenzie, High Commissioner for New Zealand, by the New Zealand Government, in place of the Hon. Sir William Hall-Jones, K.C.M G., late High Commissioner, resigned;


COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date March 10, with reference to the sales of West Indian Sea Island cotton:—

Since our last report only a small business has been done in West Indian Sea Island cotton and the sales amount to about 100 bales, chiefly Barbados and Antigua 19*d.* to 20*d.*, Nevis 18½*d.* and a few Montserrat at 18*d.* Prices remain very firm, particularly for the better grades, but qualities below 17*d.* are quite out of demand.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending March 1, is as follows:—

With the exception of 50 bales of stains which were sold at 16c., the sales this week consisted of various Planters' crop lots at from 28c. to 40c., Factors making concessions from their asking prices to dispose of them. There was some inquiry for the odd bags of off cotton, of which the stock largely consists, but at lower prices than Factors were willing to accept. As previously advised, Factors are anxious to dispose of their off cotton, and to do so would probably consent to yield 1 cent from our quotations, but not below this price. We have, therefore, to renew last quotations, viz.:—

Extra Fine	28c. to 29c.	= 16*d.* to 16½*d.*	c.i.f., & 5 per cent.
Fully Fine	26c. to 27c.	= 14¾*d.* to 15¼*d.*	,, ,, ,, ,,
Fine	25c.	= 14¼*d.*	,, ,, ,, ,,
Extra Fine off in preparation	25c.	= 14¼*d.*	,, ,, ,, ,,
Fully Fine off in preparation	22c.	= 12½*d.*	,, ,, ,, ,,
Fine off in preparation	20c.	= 11½*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to March 1, 1913, were 376 bales, 353 bales, and 3,562 bales, respectively.

BRITISH COTTON GROWING ASSOCIATION.

The following account of a recent meeting of the Council of this Association has just been received:—

The one hundred and ninth meeting of the Council of the British Cotton Growing Association was held at the Offices, 15 Cross Street, Manchester, on Tuesday, February 4, the President (The Right Hon. The Earl of Derby, G.C.V.O.) in the Chair.

It was unanimously resolved that Mr. Thomas Ashton who will shortly relinquish his position as Chairman of the Amalgamated Association of Operative Cotton Spinners, should be elected a Vice-President of the Association.

NYASALAND RAILWAY. Much satisfaction was expressed at the announcement that the arrangements for the formation of a Company for the purpose of constructing and working a railway from Port Herald to the Zambesi were now practically completed. This railway will be of great benefit to the cotton-growing industry in Nyasaland, as at the present time cotton and other produce are often held up at Port Herald for several months in each year owing to the shallowness of the Shire river. The Association have been pressing for the construction of the railway for same considerable time, but the matter has been delayed owing to the stringency which has recently prevailed in the money market. This difficulty has now been practically overcome, however, and several friends of the Association have agreed to underwrite a portion of the capital required

The latest reports as to the crop in Nyasaland show that the rains have been satisfactory this season, and a number of European planters have sown cotton in preference to tobacco, and there is every appearance of a considerable increase in the acreage under cotton on the large plantations; there is, however, some doubt as to whether the natives will be inclined to plant cotton on a large scale instead of food-stuffs, owing to the failure of the crops during the past two years through drought and the subsequent famine in food-stuffs.

NEW CAPITAL. Reference was made to Lord Emmott's speech at the recent meeting of the Oldham Chamber of Commerce, where he had stated that the Association must, in about eighteen months or two years from the present time carefully consider its position, and decide what its future course must be. It is probable that before long it will be necessary to raise additional capital on a commercial basis, but it is essential that the whole of the original capital should first of all be subscribed, and it was decided that urgent appeals be sent to the representatives of the Federation, the N. and N.E. Lancashire Association and the Operatives, pointing out the importance of the balance of the capital being raised as soon as possible, and expressing the hope that they will get in the remainder of their subscriptions without delay. Out of the total authorized capital of £500,000, about £475,000 has been subscribed and promised, up to the present, leaving a deficiency of £25,000.

WEST AFRICA. The cotton buying returns for Lagos are very satisfactory, for the month of February 2,800 bales have been purchased, making a total of 3,013 bales since the beginning of the year, as compared with 2,072 bales for the same period of last year, and 1,282 bales for 1911. The purchases in Northern Nigeria for the month of January were 143 bales. Samples of the new crop have not yet been received, but the quality is reported to be superior to that of previous years.

SUDAN The reports as to the condition of the crops at the Sudan Plantations Syndicate's Stations at Zeidab and Tayiba continue to be very satisfactory, and there have been 200 applications for land this year, nearly all from local men. Lord Kitchener visited Tayiba early in January and made a thorough inspection of the cultivation and appeared pleased with what he saw.

UGANDA. The cotton crop appears likely to be a record one, and the purchases so far this season have been greatly in excess of any previous year.

OPHTHALMIA IN ANIMALS.

This condition may be defined as an inflammatory affection of the eye and the adjacent structures.

All domesticated animals may be affected by the simple form, but cattle and young calves, and to a less extent, horses and sheep, appear to be most susceptible to the infectious disease.

CAUSES. (a) Simple ophthalmia. This may be caused by the presence of a foreign body, e.g. a grass seed, dust, etc, in the eye. Mechanical injuries may also produce the same condition, as also may prolonged exposure to sun-glare, rains, and cold winds. (b) The verminous form. This is caused by *Filaria oculi* (probably the larva of *Filaria cervina*). This is a thin white filiform worm, about ¼ to ½ inch in length, the female being the longer, and no thicker than a human hair, which gains access to the aqueous humour or anterior chamber of the eye. In some cases, two or more may be found The worm is best seen early in the attack before inflammation obscures the structures of the eye, and it may be observed through a hand lens, or even with the naked eye, as an actively motile body, resembling in shape, a piece of fine cotton. It is possibly transmitted by flies and may be introduced into a healthy herd by a new animal. It seems to be more prevalent during drought. (c) Specific form. A specific micro-organism may be the cause of ophthalmia. This would appear to be the probable cause in outbreaks which are markedly infectious, several such cases having come under notice recently in the West Indies. No organism has as yet, however, been demonstrated as the causal agent.

SYMPTOMS. The first noticeable symptom is a blinking of the eyelids, which appear red and swollen. A discharge of tears occurs. The lids are tender and partially closed and the visible mucous membranes are inflamed and red. The haw (or membrane at the corner of the eye) projects more than usual and there is a marked sensitiveness to light, natural or artificial. The discharge may be tinged with blood and in three or four days may be quite thick and yellow and may contain pus; the eyelids may become glued together by the discharge In many cases the front of the eyeball is gradually covered with a whitish film, due to inflammation of the cornea, thus producing an opacity. The aqueous humour also becomes turbid. Later on, an ulcer forms near the centre of the cornea, and may work through by errosion, causing much pain and loss of sight

There is often some considerable constitutional disturbance. The animal refuses its feed, separates itself from the rest of the herd, and the temperature of the animal indicates the presence of fever. In the case of a cow in milk, the supply is much decreased.

Housed cattle seem to be more liable to the disease than unhoused. One or both eyes appear to be affected, and the result in some cases is total blindness, and the animal being unable to graze properly, loses condition.'

DURATION. Slight cases may recover under treatment in one to three weeks, other cases in two to four months, but the loss of sight is permanent.

TREATMENT. The eyes should be examined for seeds or other foreign bodies, and if present, these should be removed by means of a camel hair brush or feather. The animal should be kept in a cool dark place, separate from other stock, as the disease in the infectious form may spread to them. A purgative such as epsom salts should be given for cattle, and aloes for horses; and nitre or hyposulphite of soda may be given in the drinking water.

Local applications of warm boracic acid should be used twice daily for half an hour. In any case where only one eye is affected it is wise to treat both eyes in order to avoid infection. The eyelids should be opened by smearing vaseline between them. A clean piece of calico soaked in boracic solution should be tied over the eyes to protect them from dust, light, and flies.

The choice of medicinal agents for local application is wide. Lotions of boracic acid, salicylic acid or zinc sulphate may be dropped into the eyes twice daily, the head being held up to receive it. If very painful, a sedative may be added to the lotion.

Calomel in the dry form, either pure or mixed with finely powdered white sugar, may be blown through a quill into the eye with good effect.

In the West Indies some success has been obtained by the application of sugar and salt.

If a film forms, the inflammation should be reduced first, and an ointment of yellow oxide of mercury applied inside the lids.

The ulcer should be treated with a lotion of silver nitrate and morphine on a feather, or touched with solid silver nitrate.

The effect of treatment on the filaria, if present, is to kill it, when it drops to the bottom of the aqueous humour and in course of time becomes absorbed. It is recommended that the live worm should be removed from the eye by puncturing the cornea, but this is an operation requiring considerable skill in its performance, and a matter which should be left to the professional attendant.

St. Kitts Agricultural and Industrial Show, 1913.—A communication has been received from the Agricultural Superintendent, St. Kitts, stating that the recent exhibition in that island has this year again been successful. The show was opened formally by His Honour the Administrator, and both he and the President of the Agricultural Society (Hon S. L Horsford) regretted the unavoidable absence of His Excellency the Governor, The Imperial Comissioner of Agriculture, and the Superintendent of Agriculture for the Leeward Islands.

The total number of exhibits was over 800. The indoor section was superior to that of previous years, the show of sugar-cane and of green vegetables being particularly satisfactory. The twelve cut canes for which the first prize was awarded weighed 140lb., and three cabbages that took first prize, together weighed 32½lb., one weighing 12½lb.

The stock was disappointing in number, and in no class can competition be said to have been keen. Several fine specimens of 2 year old colts were exhibited. The driving and riding competitions were vigorouly contested and as usual were an attractive feature of the day's proceedings.

Further information in connexion with the awards of prizes and other matters will be given in a future issue of the *Agricultural News*.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents and not to the Department.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The leading article in this number recurs to the subject of a Tropical University. The direct suggestions which have recently appeared in leading British journals are elaborated from the point of view of cooperation with existing institutions and its location in the West Indies.

On page 99 will be found an account of the recent prize pasture competition at Antigua.

Under the caption Book Shelf, on page **101**, will be found a review of the World's Cane Sugar Industry, and of A Handbook of General Information on the Virgin Islands.

A veterinary article dealing with ophthalmia in animals will be found on page 103.

The Insect Notes, on page 106, constitute the first of a series of articles dealing with the important subject of root borers and other grubs in West Indian soils.

On page 110, new and important facts are presented in connexion with the cultivation of Sea Island cotton in South Africa.

The Fungus Notes, which will be found on page 110, present information concerning investigations in the West Indies and in America on galls of citrus trees. A suggestive account of the fungus flora of the soil is also given on this page.

Edaphism.

The new conception in regard to the relation between plants and the soil is connoted by the term edaphism. The nature of the theory, and its applications to agriculture, are dealt with at some length in the *Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases* for December 1912, and from this source the following information has been abstracted.

By edaphism is meant the totality of trophic and geographical relations, that is of nutrition and surroundings, between plants and the soil; consequently the fundamental problem of edaphism is the study of the liquids of the soil and of the physical, chemical and climatic factors which may modify their properties.

To illustrate this new point of view, the outcome of modern research into the physical properties of the soil in different parts of the world, mention may be made of the recent conclusions that in studying soil nutrients, the crude form of chemical and mechanical analysis of air-dry soil does not give results that are truly representative of the nutritive potentialities of the soil investigated. For instance, liquids of different composition can be obtained from the same soil by pressure, washing (trituration) and leaching by rain; and it is held that in nature two soils of similar chemical composition may give rise to entirely different plant conditions as a result of continual alterations in the concentration of the soil waters.

States of constant and variable concentration of the soil solution are considered to be properties of the greatest importance not only as regards the permanence of certain substances in the soil but also for the function of absorption by the roots of plants.

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Function of Insoluble Constituents of Rubber.

Clayton Beadle and Stevens have recently published in the *India Rubber Journal* (February 15, 1913) a paper describing the results of investigations into the insoluble constituents of Ceara (Manihot) and Rambong (*Ficus elastica*) rubbers. In former experiments, Hevea rubber had been investigated in a similar manner.

Ceara and Rambong rubbers were chosen because the former usually contains a relatively large proportion of nitrogen and the latter a very small proportion. By treating the rubbers with benzene the following samples were obtained:—

(1) The lower dark portion of the benzene solution containing the insoluble matter.

(2) The upper clear portion free from insoluble matter.

(3) Rubber swollen in benzene and recovered by spontaneous evaporation without separation of the constituents.

Determinations of the nitrogen in these samples showed that in the case of all three rubbers, namely Hevea, Ceara and Rambong, (1) contained a larger percentage of nitrogen and (2) a smaller percentage of nitrogen than the original rubbers.

Since the separation of insoluble matter was equally complete in every case it follows that the nitrogen content of rubbers is only a very rough guide as to the amount of insoluble matter that they contain.

The samples were then vulcanized with sulphur under pressure and analysed and also tested physically. It was found that Ceara and Rambong rubbers behave in the same manner as Hevea on removal of the insoluble constituent, the effect being to reduce the percentage of combined sulphur, the resulting vulcanized rubbers being much undercured and very weak, whilst the untreated rubbers under the same conditions of vulcanization are fully cured or even overcured. Similarly the effect of additional insoluble matter is to increase the proportion of combined sulphur.

By calculating the percentage of nitrogen remaining in the rubber free from insoluble matter, on the nitrogen originally present, it was concluded that the insoluble matter in rubber plays the part of a sulphur carrier and vulcanizing agent independently of the proportion of the nitrogenous substance or substances which it contains.

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The Adulteration of Jams.

In view of the industrial importance of preserve-making in certain parts of the West Indies, and of the large consumption of imported jams in these Colonies, considerable interest attaches to a paper on the above subject which appears in the *Journal of the Royal Society of Arts* for February 21, 1913.

In this it is stated that although many jam manufacturers, by using illusive labels, generally keep within legal limits, yet the adulteration or so-called 'improvement' of jams by the addition of the juice of cheaper fruit of another kind is widespread and extremely profitable, in spite of occasional fines, to the manufacturers concerned. Lurid accounts of the employment of turnips, carrots, vegetable marrow, or of the celebrated pip-making machine are not to be considered seriously. The mainstay of adulteration by intermixture is the apple, whilst lemons, gooseberries and even rhubarb are used in some cases. Marmalade is often deprived of peel to supply the requirements of essence or candied-peel makers. In the case of strawberry jam the addition of gooseberry juice appears to be necessary to supply the stiffening principle (pectin) which is greatly lacking in the strawberry fruit.

In considering the detection of impurities it is stated that fragments of extraneous fruits can be detected by simple microscopical methods preferably with the use of polarized light. Lemon and orange preserves, for instance, contain curious contorted cells very different from any structure in English fruits. The detection of juices, however, requires the application of a method based on a knowledge of colloids. The method is known as the lead iodide process. The principle on which it rests is the formation in different juices of specific aggregates which are photographed under the microscope before crystallization sets in.

Streptothrix in the Soil.

These micro organisms have been found to be instrumental in fixing the nitrogen of fertilizers and soils, thereby diminishing the loss from denitrification. According to the *Experiment Station Record* for November 1912, results have shown that Steptothrix compose from 20 to 30 per cent. of the micro-organisms in loam soils, from 8 to 15 per cent. in clay soils, and from 7 to 10 per cent. in sands. Fallow soils contained larger numbers than cultivated soils. Streptothrix are able to decompose peptone, blood, bone meal, and straw, splitting off large quantities of ammonia which is retained in the soil for the use of plants.

The organisms produced no nitrification nor was there any assimilation of free nitrogen, but the presence of these organisms did not diminish the assimilative capacity of Azotobacter.

It is stated that Streptothrix aid in the production of nodules on the roots of Papillionaceous plants.

The organisms are also abundant on roots of Aspidium, Quercus, Ulmus, Gramineae and on decaying plant débris.

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New Varieties of Alfalfa.

Several attempts have been made in the past to establish alfalfa as a fodder crop in the West Indies. The general experience has been, however, that the crop flourishes during the first year but eventually loses its vigour and often succumbs to what appears to be a root disease. Several strains of seed have been experimented with: seed raised in the West Indies, and seed obtained from Arabia through the courtesy of the United States Department of Agriculture. In one island where this African seed was tried under estate conditions, there seemed to be some possibility of its possessing the requisite characteristics, and the matter calls for further consideration in connexion with information recently presented in *Bulletin No. 258 of the Bureau of Plant Industry of the United States Department of Agriculture.*

This Bulletin describes the breeding (including methods of cross-pollination) and the characteristics of new varieties of alfalfa possessing definite underground stems. The biological significance of these rhizomes is, of course, resistance to climatic extremes. Many of the varieties found lately in Northern Africa bear rhizomes which may travel several feet before coming to the surface. During the underground development, branching takes place to a greater extent than has been observed previously in other forms, but the roots on these alfalfas are not well developed, at least during the earlier stages of growth. The varieties grow in exceedingly dry sandy soil under the intense heat and drought of African summers, and it is remarked that a similar growth would be a welcome sight in the semi-arid regions of the United States. It does not seem improbable that in this newly considered feature of alfalfa may lie the secret of successful selection and cultivation of the crop in the West Indies.

INSECT NOTES

ROOT BORERS AND OTHER GRUBS IN WEST INDIAN SOILS.

The insects which attack crops underground are at the present time being recognized as of considerable importance, and interest in these insects, especially in the larvae of certain beetles, is being manifested in many parts of the world.

It is the purpose of this series of articles to present a review of the situation with regard to those beetle larvae which are known in the West Indies to attack the underground portions of the sugar-cane and other crop plants, with observations on related species of which the adults are known, whilst the habits of the larvae are unknown.

The insects to be dealt with belong to the natural order Coleoptera, and are placed in the two important groups, the Rhynchophora, which includes the weevils, bill-bugs, and snout beetles (in the West Indies certain of these are known to many persons as lady-birds) and the Lamellicornia or Scarabeidae, among which are included the ordinary hard-backs, May beetles and many others.

Information with regard to several of these insects has been presented from time to time in the publications of the Imperial Department of Agriculture and in other literature. Reference to the more important of these will be found in connexion with the account of each in the present article.

RHYNCHOPHORA.

The root borer of the sugar-cane (*Diaprepes abbreviatus*, L.). References: *Agricultural News*, Vols. X, p. 218, XII, p. 58—this latter is a review of a report on insect pests in Barbados and refers to previous accounts and gives a description of the occurrence of this pest and its egg-laying habits in Barbados during 1909-10, with figures of adult and larva; *West Indian Bulletin*, Vol. IV, p. 37, contains an account by the Rev. N. B. Watson, F.E.S., of the life-history, with a figure of the larva; *Insect Pests of the Lesser Antilles*, p. 66, gives a general account of the pest, with figures of adult, larva, eggs, and nature of injury to canes.

Diaprepes abbreviatus occurs in Barbados, St. Lucia and Dominica. It is only in Barbados, however, that it is recognized as a serious pest, where, in one section of the island, it has for several years been the cause of sufficient injury to ripening canes to bring about a very considerable loss in the yield of sugar.

In June 1900 and 1901, the root borer was reported to be attacking canes, and in the latter of these years it was discovered by Mr. Maxwell-Lefroy, then Entomologist on the staff of the Imperial Department of Agriculture, feeding on the roots of the Bahama grass (*Cynodon dactylon*). About this time (1901-2) Mr. Watson worked out the life-history of the *Diaprepes abbreviatus*, beginning, in the first instance, with grubs found feeding on the roots of sweet potato; the results of this study were published in the *West Indian Bulletin*, in 1903 (reference given above). At this time, however, the insect was not considered a pest, and was thought to be of interest only on account of occasional occurrences in connexion with sugar-cane and sweet potatoes

In 1903, a weevil grub believed to be the larva of *Diaprepes abbreviatus* was recorded as causing injury to the root of a cacao tree in St. Lucia. This appears to be the only reported occurrence of this insect causing injury to crops outside Barbados. Several references are made to the occurrence of *Diaprepes* in Barbados in the next few years. In 1909, the serious nature of attacks of this insect appear to have been realized for the first time, and from then to the present season sugar-cane growing in a limited area in the south-western portion of the island has suffered from repeated attacks.

During 1912, lime plants in pots at the Office of the Imperial Department of Agriculture were killed as the result of the feeding of root borer grubs on the cortex or outer portion of the root, the injury being similar to that observed in the case of the cacao tree in St. Lucia, already mentioned The grubs were probably in the mould with which the pots were filled, and the lime roots were eaten in the absence of other food.

According to the reports of the Barbados Local Department of Agriculture (1909-10, 1910-11 and 1911-12) *Diaprepes abbreviatus* has been found attacking canes in nearly all parts of the island, but the district already mentioned is the only locality where the attack has caused serious loss. From the latest of these reports it appears that, since February 1912, the root borer has been the subject of a systematic enquiry involving weekly field work.

No parasite of this insect has yet been found, and no insecticide application has given any definite results.

The suggested means of control are (a) rotation of crops, (b) digging out of infested stools immediately after reaping the canes, (c) collecting the adult beetles by hand. In considering these measures the following points are to be taken into account. (a) In planning a rotation of crops it must be remembered that the root borer attacks sweet potato, Indian and Guinea corn, and these would not be suitable as crops for this purpose. The following, which are not at all or only slightly attacked, might be found useful in this connexion; cotton, cassava, eddoes, woolly pyrol and pigeon peas. (b) The results of the attacks of the root borer are first noticed in nearly full-grown canes as these begin to ripen, and as this occurs at the beginning of the dry season, the effect of root injury becomes apparent with the increased demand on the root system for moisture. Canes suffering from such an attack need to be reaped at once in order to avoid total loss of juice. At this time the majority of the root borer grubs are in the base of the stools or in the immediately adjoining soil. If the stools are allowed to remain in the ground until they begin to dry, the grubs will be found to have left them, in search of more suitable food or for the purpose of burrowing deep into the soil, where they lie dormant, awaiting more favourable conditions for feeding. (c) The collecting of the adults gives promise of being decidedly the most satisfactory method of controlling this pest. From April to June, these weevils emerge, and at that time can be collected from their hiding places in the sheathing bases of the leaves of cane and corn plants or among the leaves of pigeon peas and other vegetation growing near the infested cane. On one estate over 9,600 beetles were collected in one week. To be really effective this work of collecting ought to be most thoroughly carried out on all estates in the infested area in order to ensure satisfactory progress.

The eggs of the root borer are laid in small clusters on the leaves of the cane near the tips, where these have been split by the action of the wind, two portions of the leaf being stuck together by means of an adhesive substance deposited by the egg-laying female beetle, in such a manner as to conceal and protect the eggs. The newly hatched larvae drop to the ground and enter the soil.

The injury to sugar-cane caused by root borers is of two kinds. The young borer grubs feed on the fibrous roots, acting really at this time as root trimmers, whilst later, when they have become more fully grown, they penetrate into the underground stem portions of the cane stool. As this stage of development is reached at the time the canes are nearing maturity and the dry season is commencing, the effect of serious attack is very obvious, the canes having the appearance of dying as a result of drought. Often as many as thirty to forty grubs are taken from the base of a cane stool. During the present season (1912-13) root borer grubs have caused serious loss in fields of newly planted canes, tunnelling into the interior of the cane plants and eating the new shoots.

The subject will be continued in the succeeding issue of the *Agricultural News.*

ANTIGUA AGRICULTURAL AND INDUSTRIAL EXHIBITION.

It was stated in the last issue of the *Agricultural News*, that the Antigua Agricultural and Industrial Exhibition was held on February 20. A report on the Exhibition has been received recently from the Superintendent of Agriculture for the Leeward Islands, and this account of the proceedings is now reproduced as follows:—

The lines adopted in the organization of the undertaking were similar to those followed in the case of the Exhibition for 1911. District sub-committees were constituted in the various parishes, and arrangements were made in each for disseminating information and for receiving entries.

Despite the unpropitious character of the preceding season, a large number of entries were received prior to the opening of the show. The day previous to the exhibition, and the morning of the exhibition itself were showery, and this militated, to some extent, against exhibits being brought in from the more distant parts of the island. Nevertheless at the time the exhibition was opened, 1,214 exhibits had been staged.

The show was opened by His Excellency Sir H. Hesketh Bell, K.C.M.G., at 12 o'clock noon. His Excellency was accompanied on the occasion by the Hon. Dr. F. Watts, C.M.G., Imperial Commissioner of Agriculture, and by the Hon. T. A. V. Best, Colonial Secretary.

In the course of his remarks, His Excellency alluded to the number and quality of the exhibits, and touched on questions relating to agricultural progress in the island.

Subsequently the certificates won in the recent Agricultural Examinations were distributed to successful candidates by His Excellency, after which the Commissioner of Agriculture delivered a brief address, his remarks having special reference to the question of agricultural education in the West Indies; and in this connexion he alluded specially to the recently promulgated scheme for the establishment of a University of Tropical Agriculture.

On the whole, the character of the exhibits was decidedly high.

In the stock classes the horses and cattle shown were very fair, whilst the asses were good and the mules excellent. In the latter section, the fine display of locally bred mules calls for special notice. The classes for small stock and poultry however, were somewhat poorly represented.

In the classes for fruits and vegetables, and for sugar-canes and products, some fine exhibits were shown, and the standard reached both in the number and quality of the exhibits was surprisingly high in view of the past bad season.

The class for cotton was also well represented, and a large number of exhibits of high quality appeared.

In this connexion keen competition was evoked for the Challenge Cup presented to the Exhibition in 1911 by the British Cotton Growing Association. Samples of the various lots of lint entered for competition have been sent to England for examination and report.

A large and diversified series of exhibits appeared in the classes for plants and flowers which called for much admiration. Special mention must be made of the exhibits of roses in the section for cut flowers.

A good series of specimens was seen in the class for preserves, whilst the class for miscellaneous exhibits was productive of a varied display of considerable interest. Under this head were included such things as handicraft work, fancy work, cookery, laundry work, dairying, wood carving, and amateur photography. Many excellent exhibits were seen, but special mention must be made of the very large and beautiful series of exhibits of fancy needlework of various descriptions.

The classes for children's exhibits were fairly well represented, but the display of pot plants grown by children of the elementary schools was very disappointing. On the other hand, some excellent exhibits of vegetables grown in school gardens appeared The Challenge Cup presented by the late Sir C. C. Knollys for school garden produce, was this year won outright by the Spring Gardens School.

The exhibits shown in the class for collection display of estates produce were of good quality, but it is regretted that greater competition was not shown. This is probably attributable, however, to the past bad season. The prize in this class—a handsome silver cup presented by Mr. H. E. W. Grant, C. M. G.—was won by Fitches Creek estate.

It is also a matter for regret that more competition was not shown for the special prize presented by the Committee for the best display from the stock-in-trade of a merchant. This prize was won by Mr. R. E. Potter.

Special features of the show were the display by the island of Barbuda, and the exhibit of the Imperial Department of Agriculture, which in addition to a varied collection of experiment station produce, showed a number ef exhibits illustrating a number of special points of local and general interest relating to various agricultural industries.

The special prizes offered by His Excellency the Governor for imported stock were both won by Mr. T. E. Peters of Jolly Hill estate. The award offered by the Committee, for the best equippage was won by Mr. I. R. Dyett.

The day of the show had been proclaimed a public holiday. Favourable weather prevailed during the proceedings and the attendance was large.

DEPARTMENT NEWS.

Mr. P. T. Saunders, M.R.C.V.S., Veterinary Officer on the Staff of the Imperial Department of Agriculture, left Barbados on March 24, by the R.M.S. 'Thames' for Trinidad, in order to attend the West Indian Conference on Tuberculosis which is being held in that Colony.

In the *Colonial Reports*—Annual, No. 749, for the Leeward Islands, His Excellency the Governor, Sir H. Hesketh Bell states that the steady improvement in the economic conditions of the Leeward Islands may, he thinks, be mainly ascribed to the erection of central sugar factories in Antigua, to the establishment of a cotton industry in St. Kitts and Nevis, to the encouragement of peasant proprietors in Montserrat, and to the attraction of British capital to Dominica in connexion with the planting of limes, cacao and fruit.

GLEANINGS.

During February 1913 the following animals died in St. Vincent: cattle 31, horses 3, asses 8, sheep 3, goats 18, pigs 11. In forwarding the information it is gratifying to note that the Government Veterinary Surgeon records no deaths from anthrax.

In Montserrat the distillation of leaves from individual bay trees has been continued. Young bay trees have been taken from mountain land and planted in the nursery. Oil has been obtained from three different trees for the purpose of determining any variation in quality.

A Law has recently been passed in Jamaica called the Agricultural Societies (Special Loans) Law, 1912. This act makes it possible for the society formed in connexion with it to make loans to members not exceeding £200. The main object of the law is to provide assistance for those who may sustain damage by droughts and hurricanes.

The Agricultural Instructor, Nevis, in a communication to the Imperial Commissioner of Agriculture, states that the cotton crop in that island is now almost all reaped but the return is likely to be very poor. This is possibly to some extent the results of a dry season. Cotton stainers are still found in large numbers in some of the fields.

In the St. Vincent *Government Gazette* for February 20, 1913, is published a Report by the Entomologist of the Imperial Department of Agriculture, embodying observations made during his recent visit to that island. The subject-matter concerns pests of cotton, coco-nuts, cacao, arrowroot, lime, ground nuts, cassava and pigeon peas. Important information is given in regard to the parasitization of these pests.

Notice of judgment No. 1862 issued from the office of Secretary, United States Department of Agriculture, concerns a case of misbranding of cotton seed meal. The food stuff was guaranteed to contain: protein, 39 to 41 per cent.; fat, 6½ to 7 per cent.; ammonia, 7½ to 8 per cent.; nitrogen, 6¼ to 6½ per cent.; crude fibre, 8 to 10 per cent. Analysis of a sample of the product by a chemist of the United States Department of Agriculture showed the following results: nitrogen, 5·67 per cent.; protein, 35·43 per cent. The defendant company entered a plea of guilty and the jury imposed a fine of $50 and costs.

Coco-nut culture has been receiving considerable attention recently in Queensland. Much of the land has been cleared and already young plantations are being quickly established. As would be expected, the estates already in bearing derive an appreciable source of income from the sale of seed nuts. Catch-cropping is advocated and pine-apples are suggested as a suitable crop for growing amongst the trees. (From the *Queensland Agricultural Journal*, for January 1913.)

The Sudan *Government Gazette* for January 28, contains a notification to the effect that the Egyptian Government has prohibited the importation of cotton seed into Egypt and that no application to import unginned cotton will be entertained by the Egyptian Director General of Agriculture except to comply with existing contracts and then only in the case of Tokar grown cotton. The importation into Egypt of cotton ginned in the Sudan is absolutely prohibited (From *The Board of Trade Journal*, for February 20, 1913.)

Rubber planting in Formosa was commenced in 1908, at which time experiments were made at the Kagi government rubber planting beds with all kinds of rubber seeds. These included Hevea from South America, Manihot from Hawaii, Castilloa from Central America, Ficus from Borneo and the South Sea, as well as Funtumia and Landolphia from Africa. The present acreage under rubber amounts approximately to 15,310 acres, this land being distributed amongst five owners. (From the *India Rubber World*, January 1, 1913.)

The section in *Tropical Life* which is devoted to a description of the past and present activities of distinguished workers in the tropics, or connected with the tropics, contains, in the February issue, an autobiography of the Right Hon. Austin Chamberlain, M.P. It will be remembered that Mr. Chamberlain was the Chairman of the committee appointed to raise £100,000 for the London School of Tropical Medicine. Half of this amount has already been subscribed and there is every prospect of the total amount being collected in the near future.

The sugar crop in Mauritius begins on August 1 and ends on July 31 of the following year. For the purpose of comparing the yields this distinction is maintained in presenting the statistics. The crop for the year closing on July 31, 1912, owing principally to the extreme low temperature during the growing season, was deficient in most districts of the island. The crop of 1910 produced 214,372 tons of sugar; the crop of 1911 exclusive of local consumption was 165,806 tons or 23 per cent. less than that of the previous year. (From *Colonial Reports*—Annual, No. 744.)

An Ordinance has been passed in Papua which makes it illegal to keep stallions without a license. The penalty is £20. A vigorous system of inspection has been instituted. If in carrying out his duties an inspector shall consider any stallion is not a fit and proper animal to be kept for stud purposes and for the purpose of breeding stock, he shall direct the stallion to be castrated on or before a day not earlier than one month after the date on which the directions were given. The officers are required to inspect at least once in every twelve months every stallion within the proclaimed area.

STUDENTS' CORNER.

APRIL.

First Period.

Seasonal Notes.

On estates where old cotton is still in the field a careful examination should be made for the purpose of finding out what pests are attacking it. One of the most easily seen among these is the black scale which is often present in a large degree. Careful observation will probably reveal the presence in these of parasites. The matter may be investigated by a simple experiment. A freshly-plucked branch on which living scale insects are present is placed in a bottle or jar which has been cleaned and dried carefully; the bottle is then closed by means of a piece of thin calico which is placed over its mouth and tied around its neck by string. After a day or two at least two different kinds of flying insects will be seen on the inner surface of the vessel. Although they are very small as compared with the most commonly observed insects they are plainly different in size. The smaller one is the male of the scale insect whilst the larger one is the adult stage (imago) of the parasite. (See *Insect Pests of the Lesser Antilles*, p. 56.)

Another instructive experiment of a similar kind is to take a piece of sugar cane which is diseased with red rot and to cut out a clean or rather sterile piece of the pith with a knife which has been dipped in spirit and set light to. This portion of tissue should be placed in a boiled glass tube or jar with a few drops of boiled water, and the changes which occur during the following week should be carefully noted. The experiment may be extended by removing a little mycelium with a sterile knife and inserting this into an apparently healthy piece of cane having previously washed it on the outside with spirit to remove any other fungi or bacteria that may be present on the rind.

The editorial on A West Indian Herd Book, which appeared in the last issue of the *Agricultural News* should be well thought over by the estate student, since he is in a position to consider the matter practically chiefly in regard to what points are to be decided as typical of the working animal, the beef animal and the animal of milking strain. The beef animal should show great muscular development at the neck; have a short and massive head. The body should be wide over the chyne and thick in the crops; ribs well sprung and deep; massive at the loins and neat at the hooks. The hindquarters must be fleshed at the hocks, inside and out, and deep through the aitches. The hide in beef animals is generally thicker than in the dairy animal but it should be mellow. The tail should be thick but not too long, and well set up.

The dairy bull should show quality all over yet retain its masculine character. The muscles of the neck should be fine and long. The head should be long and dish-shaped. The animal should be fine at the shoulder blade and over the heart, and wide at the hips. The quarters should be long and thighs level. The tail should be long and whip-like showing a fine tassil.

The student should make a list of the features of a good working animal remembering however that it is not always the best looking animal which is the best worker. The origin or pedigree of the animal must also be considered.

In connexion with these notes on live-stock the article on Ophthalmia, on page 103, should be read. Notice that the disease may have three causes and be on the watch for the symptoms amongst the animals you come in contact with.

Questions for Candidates.

Preliminary Questions.

(1) Point out any differences you have observed between the appearance of the root borer and the stem borer of the sugar-cane. Compare the damage inflicted by each pest.

(2) What precautions have to be taken in the storage of (a) pen manure (b) nitrate of lime (c) Paris green?

Intermediate Questions.

(1) What are the typical characteristics of high class working cattle?

(2) Explain some of the effects of partially sterilizing the soil.

Final Questions.

(1) How might West Indian ice factories be utilized for testing fruit for export? What particular points in connexion with the fruit would you investigate?

(2) How would you find the weight of an ox without weighing it?

His Honour the Commissioner, Montserrat, states that opportunity was taken at the recent Agricultural Show in that island, to present Mr. S. W. Howes with the final certificate awarded by the Imperial Department of Agriculture in connexion with the Reading Courses Examinations.

The Use of Calkins.—The name calkin is applied to the extremity of the horse's shoe which is turned down at the heels. Calkins are used chiefly on the hind feet and on the outside heel, the inner heel being raised and narrowed to form what is called a wedge heel. Their chief use is to give a firm foothold, and on soft ground and in hilly districts, there is no doubt that they do as long as the shoes are new, and the calkins are not worn down. When this happens, the horses move with a good deal less confidence and security, and are in a worse position than if they had been shod flat originally.

A calkin by raising the heel, alters the angle at which the foot meets the ground, and may have some influence in changing a horse's gait. For this reason excessive height of the calkin should be avoided. It should be borne in mind, however, that a small calkin wears away quickly; to avoid this, it is necessary to replace the shoes oftener and therefore risk injuring or weakening the feet. The best plan to adopt in order to reduce wear, is to increase the width and breadth of the calkin, at the same time keeping it low and square.

The effect of raising the heels by means of calkins is also to lift the frog out of bearing, which causes it to become wasted from disease, since the horse is deprived of its natural safeguard against slipping. Flat shoes, on the other hand, tend to produce sound and prominent frogs, which are sufficient to afford a firm foothold particularly for light horses.

In the West Indies generally, more especially in the mountainous islands where the roads make travelling difficult, small calkins on the hind feet are useful adjuncts to progression, but their use on the fore feet is not to be advocated.

FUNGUS NOTES.

FUNGUS FLORA OF THE SOIL.

The following abstract of the results of work by C. N. Jensen on the fungus flora of the soil is taken from the *Experiment Station Record* for December 1912. The subject is an important one, particularly in the West Indies, where root diseases are so prevalent and further investigation in the Tropics along the lines indicated in the following abstract might lead to results of considerable interest and importance.

The fungus flora of the soil was found to consist of obligate saprophytes and facultative parasites, the former being by far the more abundant. According to the author a fungus should not be considered as belonging to the soil flora unless it has been directly isolated or has been shown under control experiments to live in the soil. In this connexion he demonstrated that *Phoma betae*, one of the causes of root rot of sugar beets, winters on the seed balls and not in the soil, while *Pythium debaryanum* and *Aphanomyces laevis*, other organisms which attack the sugar beet, winter as saprophytes in the soil and not on the seed balls.

The presumable facultative parasites and the obligate saprophytes determined, number 132 species and varieties, many of which are recognized as a cause of injury to economic plants.

A study was made of the effect of sulphur on the fungus flora of the soil, but three months after its application the soil yielded the same species of fungi as did samples which had received no application.

CITRUS GALLS.

Early last December specimens of lime branches bearing abnormal growths somewhat resembling crown galls, were sent to this office from Dominica. The appearance of the galls seemed to indicate that they might be caused by the fungus which produces lime and orange knot (*Sphaeropsis tumefaciens*) in Jamaica, or possible by *Bacterium tumefaciens* with which C. O. Smith has successfully made inoculations in America. Fawcett, writing in the *Monthly Bulletin of the State Commission of Horticulture* for December 1912, refers to the recent occurrence of these citrus galls in California, and his illustrations agree closely with the appearance of the specimens collected in the West Indies. While in Florida, Fawcett was able to produce the Jamaica type in his inoculation experiments, but culture tests made from the California galls have failed to show the presence of *Sphaeropsis tumefaciens*. Definite experiments are now being conducted by Smith to see if *Bacterium tumefaciens*, the cause of crown gall of peach and other plants, can actually produce the California disease.

Soon after their receipt, the Mycologist to this Department and W. R. Dunlop (now acting Scientific Assistant to the Department) carried out culture tests and inoculation experiments with the Dominica specimens. The results were similar to those obtained by Fawcett in California in that *Sphaeropsis tumefaciens* was not found to be present. Bacteria and a Diplodia were isolated, however, but inoculation experiments conducted on young lime plants about one year old gave negative results.

In most of the diseased specimens where part of the bark on a gall or the gall itself was dead, a dark-brown or black discoloration occurred in the bark and a brown or grey on the surface of the wood. Several galls had apparently perfectly healthy green bark and healthy colourless wood. They seemed in many cases to contain the remains of thorns embedded in the gall and on one specimen several thorns were observed with swollen bases.

Accordingly in the inoculation experiments already mentioned healthy thorns were removed, and in each series respectively, mycelium and bacteria were placed on the wounds thus made. The inoculations were kept moist and sterile by a wrapping of waxed tissue paper. In the case of the Diplodia series the inoculated plants in one or two cases showed slight swellings as compared with the controls but these did not develop. With the bacteria there was no difference shown between the inoculated and control plants.

As pointed out by Fawcett, the disease is not of much importance, but it is desirable nevertheless to establish whether there is any specific relationship between the different forms.

SEA ISLAND COTTON IN SOUTH AFRICA.

From time to time spasmodic attempts to grow cotton have been made in the province of the Cape of Good Hope but it was only recently that extensive trials were instituted to determine whether there exists any real commercial prospect of success. The site chosen for the experiments was in the district of Port of St. Johns, Pondoland. Several kinds of cotton have been tried including Egyptian Mitafifi cotton, American Toole cotton, Nyasaland Upland cotton and the Sea Island varieties. The results obtained with the latter kind are naturally of greatest interest and importance in the West Indies.

Five acres of Sea Island cotton were planted, and a stand of 99 per cent. was obtained. The Nyasaland cotton gave only a 52 per cent. stand. The yield of seed-cotton per acre was 1,369·8 lb. this being higher than the yield from the other varieties except American Toole which gave 2,067·5 lb.

The growth of the Sea Island cotton is said to be almost too luxuriant, since the enormous development of lateral branches excludes the sun to a great extent and thus prevents the bolls ripening. The picking of Sea Island cotton is said to be more expensive than in the case of the other varieties owing to the lobes standing upright which makes the collection of cotton a matter of some difficulty.

The *Agricultural Journal of the Union of South Africa*, December 1912, from which the above information is taken, also contains the following figures showing the cost of production and estimated profit per acre for Sea Island cotton in that country: Preparation of land and ploughing, 10*s.*; harrowing, 1*s.*; planting, 1*s.*; seed, 1*s.*; chopping (thinning out), 2*s.*; cultivating and hand hoeing, 12*s.*; picking, 36*s.*; transport, 4*s.*; wear and tear of implements, 1*s.*; sundries, 2*s.*, making a total of £3 10*s.* per acre. The returns are estimated at 1,369 lb. of seed-cotton at 3*d.* per lb. making £17 2*s.* 3*d.* the gross return; and this, less the cost of production (£3 10*s.*) leaves an estimated net profit of £13 12*s.* 3*d.* per acre. The estimated profit from an acre of American Toole cotton is £22 6*s.* 9*d.*, whilst the profit from Herlong variety is estimated at £7 7*s.* 6*d.*

The live weight of cattle can be ascertained by measurement by employing the following formula: girth^2 × length in feet × one of the following factors according to the quality of the animal: for a working animal, ·23; in the case of a well fed animal fit for the butcher ·27 should be used. The product gives the approximate weight in Imperial stones.

PERENNIAL RICE.

In West Africa, along the courses of the Senegal and the Niger, there are tracts of land which, during the rains, are often temporally flooded, but which, during the greater part of the year are extremely deficient in water-supply. In these districts of alternating droughts and inundations, there grows a remarkable graminaceous plant known as perennial rice.

An article by M. Yves Henry, Directeur d' Agriculture des Colonies Françaises, published in *L' Agriculture Pratique des Pays Chauds*, for December 1911, describes the botanical and agricultural characteristics of this species, and although the information there presented does not directly concern the majority of the West Indian islands, the high degree of interest attaching to the subject renders it desirable to publish the following abstract.

The seeds of perennial rice germinate under moist conditions in about six days, aerial shoots are given off and the root system which at first is normal soon becomes greatly modified by the gradual formation of a rhizome or underground stem. Ordinarily the aerial shoots do not fructify during the first year, but the time and extent of fruiting appear to be largely determined by the regularity and amount of flooding that the crop receives. One of the difficulties in cultivating this crop is the unevenness in the ripening of the grain as a result of the irregular submersions under natural conditions.

During the dry season the plant's existence depends entirely upon the rhizome which appears capable of resisting inordinate extremes of drought and moisture. On the retreat of the water the larger aerial shoots become layered, and it is the custom of the natives to graze then their cattle on these fields. The animals feed upon the layered straw which forms a protective carpet for the developing shoots below. Chemical analysis shows this straw to be nutritious: it is particularly brittle, however, and exceptionally rich in silica. It has been decided to utilize the coarser stems as a source of fibre for paper-making and, in the article referred to above, the practicability of the scheme is supported by a reference to the facilities for transport occasioned by the close proximity of large water-courses.

The grain is used as food by the natives. It is said not to be sufficiently plump for exportation, though hybridization experiments are in view, which may result in the breeding of a perennial rice possessing several different features of very considerable economic importance.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

The Report of Mr. J. R. Jackson is as follows:—

The month of February opened with very little, if any improvement in business, over the preceding month, or even over the closing months of the old year, and this dullness prevailed till the last week of the month, when an improved business tone was apparent both in the increased number of buyers, and in the demand for the several products. Several drugs and chemicals have commanded higher prices, but with the exception of sarsaparilla and lime juice, few alterations have occurred in products affecting the West Indies.

GINGER.

At the first spice auction on February 5, 92 packages of Cochin were offered, and sold without reserve, 47*s.* to 47*s.* 6*d.* per cwt. being paid for small cut limed, and 25*s.* 6*d.* for good rough to cut brown Calicut. A week later, namely on the 12th, ginger met with no demand; 231 bags of washed rough Cochin were brought forward, and bought in at 42*s.* per cwt. On the 19th ginger was represented by 47 bags only, of dull washed Jamaica, which sold at 48*s.* 6*d.* On the 26th the offerings at auction were 259 bags of washed Cochin, 80 of these found private buyers, and the remainder were bought in at 34*s.* per cwt.

NUTMEGS AND MACE.

Nutmegs have been in steady demand throughout the month; on the 12th 34 packages of West Indian were sold at the following rates: 93's 5¾*d.*, and 100's to 105's 5¾*d.*; 66 packages of Eastern were also sold; limed 56's to 65's fetching 7½*d.*, to 9*d.* 76's 6½*d.*, 98's 6*d.* and 130's, 5*d.* A week later prices for West Indian had advanced ¼*d.* to ½*d.* per lb. at which rate 330 packages were sold out of 343 offered. On the 19th of the month mace was represented by 59 packages of West Indian, 2*s.* to 2*s.* 4*d.* being paid for sound and 1*s.* 9*d.* to 2*s.* 3*d.* for broken at which rates the whole consignment was sold. There has been no demand for pimento or arrowroot.

SARSAPARILLA.

For this drug, prices have advanced during the month. At the first auction on the 6th the offerings were as follows: grey Jamaica 11 bales, Lima Jamaica 4 bales, and native Jamaica 14 bales. The whole of the grey Jamaica and Lima Jamaica were sold, and of the native Jamaica 4 only out of the 14 offered found buyers at 1*s.* for fair red, and 10*d.* for fair palish red slightly mixed. The 11 bales of grey Jamaica fetched from 2*s.* 1*d.* to 2*s.* 2*d.* per lb. which was from 2*d.* to 3*d.* per lb. advance on previous prices; 1*s.* 10*d.* per lb. was the price paid for the 4 bales of Lima Jamaica. A fortnight later, namely, on the 20th, the offerings amounted to only 4 bales of grey Jamaica and 10 bales of Mexican, for the former 2*s.* 4*d.* per lb. was paid for fair, and 2*s.* 5*d.* for good beardy. The Mexican was not disposed of.

KOLA, CASSIA FISTULA, LIME JUICE, LIME OIL.

In kola there has been a steady demand during the month, and good prices have been realized, at the beginning of the month as much as 5*d.* per lb. was the quoted price for good West Indian halves. At auction on the 20th the offerings amounted to only 3 bags, all of which were sold, 4⅓*d.* being paid for good West Indian whole nuts and halves, and 4*d.* for slightly mouldy. Of Cassia Fistula 37 packages were offered at auction on the 6th, and 15 of Java, fair fresh pod somewhat lean, were sold without reserve at 17*s.* 6*d.* Lime juice has maintained a firm position throughout the month, at the first sale some 16 packages were offered, but two hogshead only were disposed of at 1*s.* 6*d.* per gallon for good pale raw Dominican. A week later good green raw West Indian, was quoted at 1*s.* 7*d.* and at the end of the month it was reported that in consequence of its scarcity, good raw West Indian would fetch 2*s.* if obtainable. Only one tin of hand pressed Dominica lime oil was offered at the first auction on the 6th and it was sold at 9*s.* 9*d.* per lb. On the 20th 6 packages were offered, namely, 2 of hand pressed St. Lucia and 4 of distilled St. Lucia, the former realized 11*s.* 6*d.* per lb. and the latter 1*s.* 4*d.* per lb.

MARKET REPORTS.

London.—The West India Committee Circular, March 11, 1913; Messrs. E. A. De Pass & Co., February 28, 1913.

Arrowroot—3⅞d. to 4¾d.
Balata—Sheet, 3/3; block, 2/2½ per lb.
Beeswax—£7 12s. 6d. to £7 15s.
Cacao—Trinidad, 73/- to 81/- per cwt.; Grenada, 67/- to 73/-; Jamaica, 63/- to 70/-.
Coffee—Jamaica, 68/6 to 84/-.
Copra—West Indian, £29 5s. per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 18d. to 20d.
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet, 46s. to 63s.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 1/5 to 1/8; concentrated, £20 to £24; otto of limes (hand-pressed), 10/- to 10/6.
Logwood—No quotations.
Mace—1/9 to 2/9.
Nutmegs—5¾d. to 6½d.
Pimento—2¼d. to 2⅝d.
Rubber—Para, fine hard, 3/10½; fine soft, 3/10; Castilloa, 3/6 per lb.
Rum—Jamaica, 2/3 to 6/.
Sugar—Crystals, 16/6 to 19/3; Muscovado, 11/- to 14/-; Syrup, 11/6 to 13/3; Molasses, no quotations.

New York.—Messrs. Gillespie Bros. & Co., February 21, 1913.

Cacao—Caracas, 15c. to 15½c.; Grenada, 14¾c. to 15c; Trinidad, 15¾c. to 16¼c. per lb.; Jamaica, 13c. to 13¾c.
Coco-nuts—Jamaica, select, $31·00 to $32·00; culls, $20·00 to $21·00; Trinidad, select, $32·00 to $34·00; culls, $20·00 to $21·00 per M.
Coffee—Jamaica, 13¼c. to 16c. per lb.
Ginger—8¾c. to 12c. per lb.
Goat Skins—Jamaica, 50c.; Antigua and Barbados, 48c. to 50c.; St. Thomas and St. Kitts, 44c. to 46c. per lb.
Grape Fruit—Jamaica, $2·75 to $3·25.
Limes—$6·00 to $6·75.
Mace—50c. to 57c. per lb.
Nutmegs—110's, 13c.
Oranges—Jamaica, $2·00 to $2·25 per box
Pimento—4c. per lb.
Sugar—Centrifugals, 96°, 3·45c. per lb.; Muscovados, 89°, 2·95c.; Molasses, 89°, 2·70c. per lb., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., March 17, 1913.

Cacao—Venezuelan, $16·00 per fanega; Trinidad, $15·50 to $16·00 per fanega.
Coco-nut Oil—$1·03 per Imperial gallon.
Coffee—Venezuelan, 15c. per lb.
Copra—$4·50 per 100 lb.
Dhal—$4·25.
Onions—$1·50 to $3·00 per 100 lb.
Peas, Split—$6·00 to $6·25 per bag.
Potatoes—English, $1·50 to $1·75 per 100 lb.
Rice—Yellow, $5·50; White, $6·75 to $7·00 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., March 22, 1913; Messrs. T. S. Garraway & Co., March 22, 1913.

Arrowroot—$6·00 to $7·50 per 100 lb.
Cacao—$12·00 to $12·50 per 100 lb.
Coco-nuts—$16·00
Hay—$1·50 per 100 lb.
Manures—Nitrate of soda, $75·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $85·00 per ton.
Molasses—No quotations.
Onions—$1·80 to $6·00 per 100 lb.
Peas, Split—$6·00 to $6·25 per bag of 210 lb.; Canada, $3·00 to $4·50 per bag of 120 lb.
Potatoes—Nova Scotia, $2·75 to $3·00 per 160 lb.
Rice—Ballam, $5·20 to $5·25 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $4·00 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, March 15, 1913; Messrs. Sandbach, Parker & Co., March 14, 1913.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	——	——
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	——
Cacao—Native	18c. per lb.	19c. per lb.
Cassava—	60c.	——
Cassava Starch—	$6·50	——
Coco-nuts—	$16 to $20 per M.	$10 to $16 per M.
Coffee—Creole	17c. per lb.	18c. per lb.
Jamaica and Rio	18c. per lb.	20c. per lb.
Liberian	13c. per lb.	13c. per lb.
Dhal—	$3·75 per bag of 168 lb.	$4·00 bag of 168 lb.
Green Dhal	$5·00	——
Eddoes—	72c. to $1·00	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	7c. to 8c. per lb.	6½c. to 8c. per lb.
Peas—Split	$7·00 per bag (210 lb.)	$7·30 per bag (210 lb.)
Marseilles	——	——
Plantains—	16c. to 40c.	——
Potatoes—Nova Scotia	$2·75	$3·25
Lisbon	——	——
Potatoes-Sweet, B'bados	$1·00 per bag	——
Rice—Ballam	No quotation	——
Creole	$4·75 to $5·00	$5·00
Tannias—	$1·20	——
Yams—White	$1·68	——
Buck	$1·44	——
Sugar—Dark crystals	$2·20 to $2·30	$2·25
Yellow	$3·25 to $3·60	$3·00
White	$3·75 to $4·00	$5·00
Molasses	——	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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FOR THE WEST INDIES.

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PAMPHLET SERIES.

The Pamphlets are written in a simple and popular manner and the information contained in them is specially adapted to West Indian conditions. They contain, amongst other subjects, summaries of the results of the experiment work on sugar-cane and manures, the full official reports of which have only a limited circulation. The number issued up to the present time is seventy. Those mentioned in the following list are still available: the rest are out of print.

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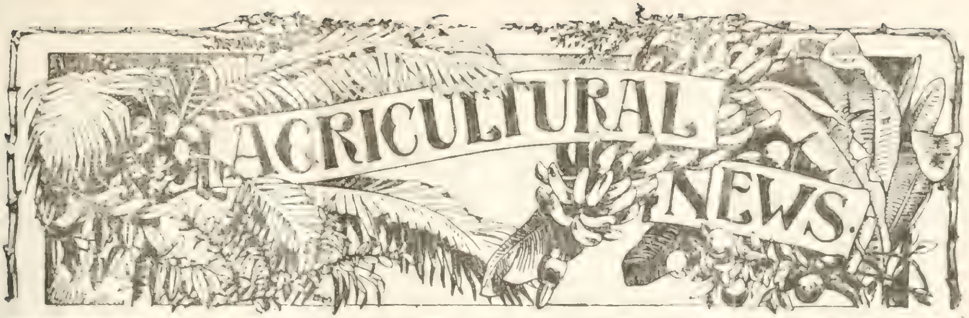

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The Improvement of West Indian Pastures.

THE term cultivated land is perhaps an unfortunate one because it tends to induce a feeling in the popular mind that pasture land belongs to the category of uncultivated things, and may be left to look after itself. And it must be admitted that casual inspection in the West Indies will often appear to confirm the impression, though a technical consideration of the matter will soon make it evident that the conditions of pasture land are extremely complicated and artificial, and respond in a remarkable degree to well-applied methods of cultivation and care.

Some idea of the complicated relations that exist in a pasture can be got from the fact that there may be present as many as 1,000 plants to the square yard. In West Indian pastures these plants are mostly of one species whose similarity as regards habits and requirements greatly augments the struggle for existence. Moreover amongst the animals which consume the vegetation, complicated relations exist, which increase, and demand more skilful adjustment, in proportion to the density of the animals over a given area.

In proceeding to enumerate practical methods for the improvement of pastures, it will be convenient to regard the subject in two ways, first from the point of view of the productive powers of pastures, and secondly from the standpoint of their hygienic characters. It is proposed to deal with the former aspect first.

In considering the productive or purely agricultural characters of West Indian pastures, the circumstance that the best land is under arable cultivation must not be lost sight of. The significance of this fact lies in the necessity for improving the soil conditions of existing grass land. Water-supply is of primary importance. On some pastures, particularly during the rainy season, excess of water and drainage may be the leading problem. The bearing of stagnant water upon the hygienic characters of a pasture will be considered in due course, but it may be pointed out, in the present connexion, that the removal of excess of water greatly modifies and improves the vegetation, and lessens the ill-effects of drought. More frequently it is the want of rain that is the chief trouble. Irrigation is generally out of the question, and the only other way of ameliorating the soil conditions is by the application of organic manure with a view to increasing the retention of moisture through the accumulation of humus. Closely connected with this matter is the question of manuring generally. The feeding of artificial foodstuffs to the animals is the most satisfactory way of increasing the supplies of plant food, for one-half of the nitrogen, two-thirds of the phosphoric acid, and nearly the whole of the potash fed in the food is excreted in the fæces as manure. Mineral fertilizers are often of considerable value too, though few definite experiments have been conducted with them in the West Indies. Provided that the conditions of water-supply are good, nitrate of soda is likely to stimulate the vegetative growth of grasses; basic slag has also proved useful on heavy land under pasture, chiefly, perhaps, on account of the free lime it contains and the occasional lack of phosphoric acid in clay soils. Potash manures are known to stimulate the development of leguminous plants in a marked degree, and finally free lime and even common salt exert a favourable influence under certain conditions.

These facts however are, to a large extent, secondary matters compared with the thorough establishment of the pasture in the first place. The preliminary cultivation before the planting of the land is extremely important, for on this depends the nature of the first year's growth which will indicate the future success of the established ley. Nor should cultivation be restricted to the preparation of the land. A pasture, like cotton or sugar-cane, is a growing crop. It demands careful interculture. This should consist of frequent weeding, and scratchings with a light harrow. The weeding lessens competition and the harrowings spread the fæces of tethered animals and remove dead grass stems, thereby letting in air and sunlight.

Lastly we have to consider the vegetation itself from the point of view of improvements in regard to the establishment of pastures. In proceeding to this question it will be necessary to understand that our definition of a pasture is intended to include land planted in both perennial and annual fodder plants. It seems that in the West Indies the intermediaries between a permanent ley and an annual ley are not fully recognized. For this reason little attention has been devoted to the judicious intermixture of grasses of varying periods of duration and habits, of which the object is to reduce competition and govern growth, so as to produce a maximum but evenly distributed yield throughout the year. The important characteristics to be considered in pasture grasses are duration, depth of root system, tall and tufted habits, and adaptability to certain soils and climatic conditions. The nutritive value of the species is an important matter as is also the question of inclusion of leguminous plants.

In the Tropics there is no large selection of pasture plants to drawn upon such as exists in temperate countries, but there is a considerable number of grasses. Useful annuals like *Eragrostis abyssinica* (teff) and *Panicum Colonum* occur in the West Indies, and also well-known perennials like *Panicum maximum* (Guinea grass), *Sporobolus indicus* (bed grass), *Paspalum conjugatum* (sour grass), *Panicum muticum* (Para grass),—which is the most nutritious of them all—and *Andropogon caricosus* (hay grass)—a plant very rich in soluble carbohydrates. There is also the little creeping trefoil (*Stylosanthes procumbens*) which is seasonal in habit but apparently useful as a fixer of atmospheric nitrogen. These examples by no means exhaust the list of plants that are available, and it would seem not improbable, that after a few trials and systematic observations had been made, more accuracy and precision might be introduced into the selection of planting material for pastures of varying duration. For the question of temporary pastures is of much significance, since by means of them it might be practicable to increase the present area under grass through the introduction of leys forming a rotation with sugar-cane, cotton or provision crops, a practice which has already been adopted by some of the successful land-holders in St. Vincent and elsewhere. The full significance of this suggestion will be better appreciated in due course.

Turning now from the productive characters of pasture land to considerations of animal hygiene, we are first of all met by the great problem of tick eradication. The serious nature of the problem needs no explanation. The general methods of prevention and cure are also familiar. The chief difficulties lie in their application. In considering tick eradication it is necessary to bear in mind that some ticks are continuous feeders, whilst others are interrupted. It is the latter which mainly influence the hygienic characters of pasture land, since the grass becomes infected, which results in the communication of the pest to animals newly arrived. Prevention lies in the resting of these infected pastures. But as already indicated the area at present under grass leaves no margin for the closing up of fields, and then again the absence of fences puts difficulties in the ways of efficient quarantine. The best solution would appear to lie in the establishment of temporary leys as already suggested. The intermediate cultivation would eradicate infection, whilst the crop produced would pay for the application of the measure and at the same time bring in a tangible financial profit. In a matter such as this, and also in the matter of curing tick infestations by spraying or dipping, united action is essential. The attitude of the owner who says he will not act unless others do, has much to support it, and if sufficiently strong should be effective in the long run in arousing public opinion to the necessity for stringent legislation.

Another point which should not be lost sight of in connexion with the subject of ticks is the varying susceptibility of different breeds of cattle to the pest. It does not directly concern the improvement of pastures but may be noted here. A correlation has been found to exist between the characters of the hide of animals and susceptibility. The Zebu hide seems to be more resistant than that, say, of the Hereford. It would appear to offer greater mechanical resistance to the bite and it is believed that the greater secreting powers of the sebaceous glands in the Zebu give rise to conditions that are repellent to the parasite.

Reference may also be made briefly to other diseases with which pastures become infected. 'Husk' or 'hoose' is caused by a worm parasite of the throat. This organism, like the hook worm which infests the intestinal tract of many animals, spends a part of its life-history on pastures provided that conditions are sufficiently moist. The prevention of these complaints therefore depends largely upon efficient drainage. Of the contagious diseases of bacterial origin anthrax is one of the worst. Pastures in which cases have recently occurred should be ploughed up and other crops planted for several years.

In conclusion it is well to bear in mind that quite apart from the production of fodder and of healthy surroundings, a pasture should afford the animals a certain degree of comfort. Provision of shade is desirable and a suitable tree for this purpose is the Saman (*Pithecolobium saman*). Incidentally the pods of this tree are nutritious and are much enjoyed by cattle. Drinking water is also appreciated by the animals in the field, though care has to be taken to keep it clean and free from infection. Not the least desirable feature of a pasture is an efficient fence which, as already pointed out, aids in preventing the introduction and spread of disease: it also renders superfluous the unnatural custom of tethering and the constant worrying of cattle-minders, thereby increasing the comfort of the animals and improving the pasture through more regular and even grazing.

SUGAR INDUSTRY.

THE POSITION OF THE AUSTRALIAN SUGAR PRODUCERS' ASSOCIATION.

The editorial in a recent number of the *Australian Sugar Journal* (February 6, 1913) considers the position of the above organization in relation to the Australian sugar industry as a whole. It is pointed out first of all that the Association is based on the assumption that the interests of cane grower and sugar manufacturer are identical on every feature of the industry save alone the one critical question of the price of cane. A shortage in the supply of cane is ruinous to the manufacturer; any failure in milling capacity must react disastrously upon those who have cane to sell. The value of meetings of the Association in the adjustment of these relations, has evidently proved as great as the benefits derived from the activities of the organization in following up, and guarding the interests of the Association in matters of political policy and economics, particularly as regards labour questions and the law of supply and demand.

Another development which this combination of growers and manufacturers has made practicable, is the establishment of a powerful co-operative insurance company, which provides for the mutual protection of all its members against claims under the Employer's Liability Act, and the covering of all fire risks over estate and mill buildings and the growing crops. Another object which the Association has achieved is the establishment of its own monthly newspaper, which is accepted as an authoritative exponent of the views of all classes of sugar producers.

Finally, there is no part of the society's movement which has received more careful consideration (though the object has not yet been attained) than the establishment of fully equipped experiment stations, such as those to be found in Hawaii and Java. Questions of cane varieties, combating of pests and diseases, choice of manures and cultivation, rank side by side with those of chemical and machinery control, and the appointment of technical advisors to visit the central factories

Interesting facts are presented in the *Agricultural Journal of the Union of South Africa*, for January 1913, in connexion with the cultivation of the sugar-cane in that country. Since the climate of South Africa is only semi-tropical the planter has to wait two years for each crop The settler desiring good sugar land judges the soil by the vegetation, the more luxuriant it is, the better. In starting a plantation the wild vegetation has to be cleared; this may cost from 30*s.* to £6 per acre. Tops of old cane are planted, and they sprout in about three days, but as already stated take two years to mature. The yield is from 21 tons to 30 tons of cane per acre.

FRUITS AND FRUIT TREES.

VANILLA CULTIVATION AT ST. VINCENT.

The following account of a recent visit paid to an estate in St. Vincent, by the Agricultural Superintendent, is of considerable interest and importance, in view of recent efforts to extend the vanilla industry in the West Indies, particularly in Dominica (see Report on the Agricultural Department, 1911-12), in Nevis, and in the island at present under consideration.

Some years ago the Agricultural Department of St. Vincent imported a number of plants of vanilla (*Vanilla planifolia*) from the Seychelles. A few of these were distributed to Mr. P. F. Huggins of Bellewood estate, who has since propagated from them, and established a small cultivation. After making a number of experiments involving different methods, Mr. Huggins has devised a system whereby he obtains fairly good results, notwithstanding that his estate is situated at an elevation of 1,500 feet in the mountains, and has an average yearly rainfall of over 120 inches.

The annual output of the estate is now about 40 ℔. of pods, which realize, on an average, 2*s.* less per ℔. than the best grades on the market. With the new drying house that he has recently built, Mr. Huggins hopes to obtain still better results. The lands are surrounded by high hills covered with forest. The vanilla vines are planted in small sheltered clearings in the forest where the soil is of a good depth, light, and rich in vegetable matter. After many trials in the endeavour to find a satisfactory support for the vines, it was found that they thrived well on stems of the tree fern (*Cyathea arborea*). These plants were found to be very durable and did not require renewing for several years. Tree fern stems are therefore used in preference to live or dead posts. Mr. Huggins, however, is trying at the present time a trellis system, using Page wire fencing, to which are tied rods of 'Roseau' grass (*Gynerium saccharoides*); but it is too early yet to judge whether this method will prove a success.

In cutting tree ferns for support, the oldest ones that can be obtained are selected, and cut into posts 7 to 8 feet in length so as to allow, when set up, a height of 6 feet out of the soil. Holes are bored horizontally 1 foot apart through each post, and at right angles to each other. Through these holes are placed pieces of 'Roseau' cane, so arranged that about 8 inches of the cane protudes on each side of the post. Additional support for the vines is thereby provided. The posts are arranged in rows 6 feet apart.

The cultivation and pruning of the vines as well as the pollination of the flowers are conducted along the usual lines. The pods produced are of good size and shape and measure from 8 to 10 inches in length.

It is in the curing of the pods that there appears to be some divergence from the methods described in publications on the subject. After being picked, the pods are scalded in water for a few seconds, the time being judged by counting from 1 to 8 slowly. After being drained, the pods are wrapped in the leaves of a native large-leaved aroid called 'Chainey', and placed in a box for four or five days to ferment. When the pods have assumed a soft brown 'maroon' colour they are taken out and placed on leaves in the drying house. This drying house is well ventilated, and arranged with shelves covered with ½-inch mesh galvanized wire-netting. The pods are spread out in a single layer and constantly 'smoothed' and turned until they assume a very dark-brown colour, silky feel; and possess a supple consistency. They are then sorted into lengths and grades and packed in bundles in tins.

Mr. Huggins states that quite 25 per cent. of his pods split in curing. This he considers to be due, in a large measure, to the difficulty of picking each pod at just the right stage of ripeness.

After several years of close attention Mr. Huggins appears now to have successfully surmounted most of the difficulties he encountered in the beginning, and must be complimented on the satisfactory result of his persistent efforts towards the establishment of a small vanilla industry.

Notice of Judgement No 1940 issued from the Office of the Secretary, United States Department of Agriculture, concerns the case of misbranding of vanillin powder. The product was labelled: Vanillin powder—A Substitute for Alcoholic Extract of Vanilla. Analysis of a sample of the product by the Bureau of Chemistry showed it to be composed of vanillin, 0·63 per cent., coumarin (the flavouring constituent of tonka bean) 0·31 per cent., and qualitative examination showed the vehicle or diluent consisted of corn starch 45·7 and cane sugar 4·95 per cent. The defendant company entered a plea of guilty to the information, and the court imposed a fine of $50.

THE PRODUCTION OF HYDROCYANIC ACID IN PLANTS AND SEEDS.

Reference has been made from time to time in this journal to the poisoning of cattle through eating sorghum or Guinea corn, one of the last instances being in the issue of January 20, 1912, where a description was given of a case in Queensland, in which cattle feeding on young sorghum growing on a rich soil were poisoned, whilst others feeding on sorghum, all of the same age, growing in adjacent areas on a much less fertile soil, remained healthy. This circumstance led to an investigation in which sorghum was grown in a very sandy soil, both unmanured and manured with nitrate of soda; the results showed that the manured plants always contained the greatest amount of hydrocyanic acid, and that sorghum grown in very rich nitrogenous soils cannot be safely used for feeding stock until the plants are about to set seed. *L'Agriculture Pratique des Pays Chauds*, for August 1912, after referring to observations as to the poisonous nature of young sorghum in India and Algeria, gives detailed consideration to the case in Queensland, and draws attention to the rather useful suggestion that young sorghum might be safely fed to stock if it is first mixed with dry forage

Further evidence, if it is needed, of the danger of young sorghum as a cattle food, is to be found in the *Agricultural Gazette of New South Wales*, for September 2, 1912. Here, in dealing with a specific instance of poisoning, it is stated that the affected animals were saved, in all cases where the remedy was applied before convulsions had set in, by drenching them with a mixture consisting of: aromatic spirits of ammonia 1 to 2 oz., nitrous ether 1 to 2 oz., water 1 pint. This was a treatment in emergency, 'and proved as satisfactory as circumstances permitted.' The article proceeds to quote the recognized antidotes for hydrocyanic (prussic) acid poisoning in cattle; they are: subcutaneous injection of $\frac{1}{60}$ grain of atropine; subcutaneous injection of ether (5 to 10 c.c.); a mixture of ferrous and ferric salts with magnesia, given as a drench.

The effect of manures on the amount of hydrocyanic acid in plants or the parts of plants receives additional interest from the work that has been done in connexion with the formation of this and other poisonous substances in seeds. Articles appear in the *Agricultural News*, Vol. XI, pp. 63 and 104, dealing with investigations carried out at the Rome Agricultural Experiment Station with species of Phaseolus such as the haricot bean (*P. vulgaris*) and *P. multiflorus*. In the experiments, the amount of non-protein nitrogen, as a measure of the toxic principle in the seeds of these plants, was compared in seeds from unmanured plants with that in seeds from plants receiving such manures as nitrate of soda and superphosphate The quantities of non-protein nitrogen present were always least when manure was used: so that if these are taken as a measure of the hydrocyanic acid present, manuring appears to decrease the amount of this substance in seeds—a result that is the reverse of the case of the formation of that body in sorghum stems. The matter goes further for, as is explained in the *Agricultural News*, Vol. XI, p. 104, this fact of the decrease of non-protein nitrogen in seeds, through manuring, affords an explanation as to why medicinal plants in cultivation with the aid of nitrates are less rich in alkaloids than the wild plants.

In considering these results, it is only fair to state that recent work on the occurrence of hydrocyanic acid in plants described shortly in the *Journal of the Chemical Society*, November 1912, p. ii, 1085, indicates that the method used for determining the proportion of the acid present often gives results that are far too high, because of its formation during the process of ordinary ways of analysis. It is of some interest, too, that an abstract on the same page indicates that the amount of the acid in sorghum may be lessened by inoculating it with various aromatic substances.

To return to the general matter, this may be given additional interest by considering the fact that many seeds, when germinating, produce hydrocyanic acid, and that the amount of this may be changed by altering the conditions surrounding the developing embryo. An abstract of papers in *Nature* for February 22, 1912, pays attention to work which has shown that such seeds form an increased quantity of this acid when exposed to light or to an atmosphere of carbon dioxide; whilst the amount is decreased in darkness or the absence of carbon dioxide, unless a carbohydrate such as dextrose is present, when actually a considerable increase takes place. The last fact has led to the suggestion that the sugar (dextrose) acts with inorganic nitrogen, probably present as ammonia, to form hydrocyanic acid directly or indirectly. The abstract gives attention, further, to a more recent investigation, in which the formation of hydrocyanic acid by sprouting seeds of linseed (*Linumu sitatissimum*) and sorghum was largely increased by adding 1 per cent. of ammonium chloride to the water supplied for germination. Hydrocyanic acid is not present at the commencement of the germination of sorghum; it is found after some growth has been made, and as soon as chlorophyll begins to appear. Ammonia is present in sorghum seedlings before hydrocyanic acid is detected, and there is an increase in the amount of the latter substance as the quantity of ammonia in the plant increases.

As may be inferred from part of what has been said above, hydrocyanic acid (or at least the cyanogenetic glucoside which produces it) is present in linseed; this accounts for the well-known fact that cattle are sometimes, though very rarely, poisoned by eating linseed meal—a circumstance to which attention has been given in this journal. The poisoning generally takes place, however, in a very irregular way, one or more animals being affected whilst the others remain in a normal state of health. Some light is thrown upon the varying action in the different animals in a paper presented recently to the Durham University Philosophical Society, which is abstracted in the *Experiment Station Record* issued September 30, 1912. The investigation consisted in subjecting linseed meal to temperatures approaching those of animal life and collecting and examining the volatile products, when it was found that the amount of hydrocyanic acid among them was dependent on the quantities present of cyanogenetic glucoside (glucoside producing hydrocyanic acid) and of enzymes, the temperature and degree of acidity of the liquid containing the meal, and on the presence or absence of certain other substances. These facts led to the conclusion that in normal health the acidity of the stomach of an animal is too high for the production of the poisonous acid, but that it may be produced under abnormal circumstances such as when the meal is fed to an animal suffering from indigestion of such a peculiar character that the food is not made acid. If this supposition is correct, it forms some explanation of the very rare, but puzzling, cases of the poisoning of cattle by linseed meal.

Finally reference must be made to a description of work in the *Journal of the Board of Agriculture* for November 1912, which was designed to ascertain if the activity of the enzymes upon the cyanogenetic glucoside in linseed is greater when it has passed through the hot press process than it was before. The results, stated shortly, show that the hot press process does not either increase or decrease such activity.

COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date March 25, with reference to the sales of West Indian Sea Island cotton:—

Since our last report, about 100 bales of West Indian Sea Island cotton have been sold, chiefly St. Vincent 22*d.* to 24*d.*, Barbados 19½*d* to 20*d.* and St. Kitts at 20*d.*

The market remains very firm for the finer qualities, particularly St. Kitts and St. Vincent; the coarser stapled lots do not find a ready sale.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending March 22, is as follows:—

There was a continuance of the demand for the odd bags of Fine to Fully Fine off in preparation at prices ranging from 16c. to 19c., resulting in sales of upwards of 650 bales during the past ten days. Of these sales about 300 bales were included in our last report. There was also some inquiry for the Planters' crop lots, resulting in the sale of 60 bales Hamlin at 32c. The buying was for England and the Continent, but principally for the former.

In consequence of the above demand, the Factors are less willing sellers of the cotton off in preparation at the decline quoted, as such sales have entailed serious loss on the planter, being below the cost of production.

We quote, viz:

Extra Fine	28c. to 29c.	= 16*d.* to 16½*d.*	c.i.f., & 5 per cent:
Fully Fine	26c. to 27c.	= 14¾*d.* to 15¼*d.*	,, ,, ,, ,,
Fine	25c.	= 14¼*d.*	,, ,, ,, ,,
Extra Fine off in preparation	24c.	= 13½*d.*	,, ,, ,, ,,
Fully Fine off in preparation	18c. to 20c.	= 10½*d.* to 11½*d.*	,, ,, , ,
Fine off in preparation	18c.	= 10½*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to March 22, 1913, were 421 bales, 721 bales, and 4,008 bales, respectively.

NEW FACTS CONCERNING COTTON IN AMERICA.

In a recently received Circular (No. 111) of the Bureau of Plant Industry of the United States Department of Agriculture, information is presented in connexion with two interesting subjects, (1) the new type of cotton called Durango, and (2) a botanical abnormality of cotton in certain districts, which consists in the presence of supernumerary carpels in cotton bolls. Dealing first with the former subject, the publication defines Durango cotton as a new type of long-staple Upland cotton recently introduced, and now well acclimatized to the irrigated conditions in the south-western States. The superiority of the Durango variety lies in the fact that it combines the desirable cultural qualities of short-staple varieties with length and strength of lint formerly obtained only from the so-called Peeler varieties of the Delta region of Mississippi and Louisiana. The defects of the Peeler cotton are said to be absent from the Durango variety, which is early and productive, and has abundant, uniform fibre.

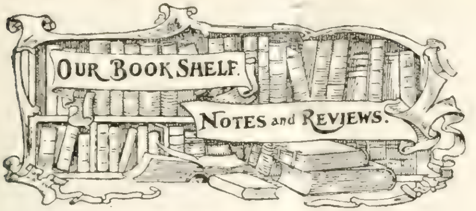
The second subject referred to, that of supernumerary carpels in cotton bolls, is of particular interest in view of certain observations in the West Indies on the occurrence of bolls with five loculi in the Sea Island plants.

In its simplest form the abnormality consisted of a solid, elongated whitish body developed near the centre of the boll between the placentae or tissues which bear the ovules. In many instances, this body was divided into two to five longitudinal compartments, resembling miniature loculi which enclosed rudimentary ovules. In one district nearly all the specimens were sufficiently well developed that they contained rudimentary lint-covered seeds, and in one specimen normal seeds and lint had developed in one of these supernumerary carpels

The occurrence of the abnormality has been fairly conclusively correlated with climatic conditions.

In conclusion it is pointed out that in some respects the abnormality resembles that found in the navel orange. There is a difference, however, in that the supernumerary carpels of the cotton boll develop at the base of the placentae, whilst in the orange they are produced at the opposite end of the fruit.

A New Invention.—A description is given in the *Experiment Station Record*, for December 1912, of a new cotton picker, the mechanism of which consists of a 16 inch cylinder, 12 inches long, on which are mounted twenty spindle shaft frames each carrying seven spindles, making 140 picking fingers in all. As the cylinder revolves, the spindles are caused to revolve at high speed as they stand in a vertical position, and the cotton wraps around them. When they come to a horizontal position they are thrown out of gear and the cotton is stripped off and passed to a basket in the rear. It is claimed that this picker will do the work of from ten to twelve men, requiring only a team and driver.


OUR BOOK SHELF.
NOTES and REVIEWS.

WEST INDIAN TALES OF OLD. By Algernon E. Aspinall. *Duckworth & Co., London, 1912.*

In the preface to this interesting book the author refers to the striking change which will come over the Caribbean Sea on the completion of the Panama Canal. One result will be an increasing number of visitors to the British West Indian Islands, and the recounting of the history of these colonies in the work under review will do much to engender increased interest.

A book which deals principally with historical matters is not to be expected to have any direct bearing upon the agriculture of the countries of which it treats, but there are several features of the work which shed light upon West Indian industrial and social conditions of the present day.

The wars of the eighteenth century of which the scene of action was largely these islands, may be said to have had an influence in the introduction of the different languages, dialects and religions which exist to day even in the British Islands. The names of many estates in St. Kitts and Dominica reflect former ownership by another nation, whilst the names of plants like Noyau and Tous-les-mois are suggestive of early French occupation.

During the period of which the book treats we read of the occurrence of hurricanes that caused a considerable amount of damage to crops which were growing at the time. The following description by the notorious Governor Park of one of these unfortunate visitations is taken from Chapter II. 'The people having made good cropps, began to be in good humour and they had allmost forgot their losses by the French (which hap'ned to them just before I arrived) but to our great misfortune on the 29th of August last in the night we had a terrible storm which is called here a hurricane, Antigua has the least damage, yet they have suffered very much; but in St. Kitts, Nevis and Montserrat most of the houses are blown down, and those that stand are miserably shattered, for my own part I have lost allmost all, I have ever since I came.'

In connexion with the description of the siege of Brimstone Hill indications are perceived of the prosperity of Nevis during the early part of the eighteenth century, and in the same chapter reference is made to the geological origin of Brimstone Hill. In another chapter we read of similar attempts to explain at that time the origin of Diamond Rock.

West Indian Tales of Old which affords fascinating reading should do much towards making the West Indies more prominent, and indirectly have an influence in increasing their agricultural prosperity.

The publication is well produced, the illustrations being particularly good. Read in conjunction with a Guide to the West Indies by the same author, it will provide many striking contrasts, and give the intending visitor to these waters an illuminative idea of the West Indies past and present.

HANDBOOK OF TRINIDAD AND TOBAGO. Prepared and published by a Committee of the Board of Agriculture. Price 6*d.* net.

The climate of Trinidad is more generally tropical than that of the other West Indian islands, and this combined with its comparatively large size, accounts for the diversity of cultivations and industries that exist in the colony. The greater part of the handbook deals with purely agricultural conditions, but reference is also made to the population, the towns, to the various institutions, and to the facilities of internal communication. A remarkable feature of Trinidad's population is that one-third of it is comprised of East Indians or descendants of East Indian immigrants, who have been specially introduced for estate labour. The remaining two-thirds consist of Europeans of British, French and Spanish descent, Chinese, Portuguese from Madeira, and the West Indian black and coloured races. It may be aptly stated that here the 'East meets the West.' For some time considerable attention has been given in Trinidad to all matters which tend to develop its own natural resources. In the publication under review an account is given of the constitution and activities of the Department of Agriculture, the Board of Agriculture and the Agricultural Society. The part of the handbook which describes the agricultural prospects of the colony gives an account of the present status of the cacao, sugar and cotton cultivations. Special mention is made of cotton cultivation in Tobago, and of the enormous development of the cultivation of cacao during late years in Trinidad. At present there are over 700 plantations having an area of over 300,000 acres. In 1910 there was exported 5½ million pounds of cacao of the value of £1,230,097. Among other crops that are cultivated in Trinidad on a large scale may be mentioned bananas, coco-nuts, rubber, rice and vegetables. Thus is very great the diversity of tropical cultivations in this colony. But Trinidad's wealth is not entirely agricultural. The petroleum oil industry is now well established, and asphalt, hitherto the most valuable of the mineral products, yields an annual revenue to the public funds, of from £45,000 to £50,000.

The part of the handbook dealing with Trinidad concludes with a chapter on how to start a cacao estate. It is pointed out that in Trinidad the most generally employed method of bringing cacao cultivation into bearing condition is the contract system. This system is controlled and regulated by a statutory Act known as the Agricultural Contract Ordinance, which governs the relations between owner and contractor. Briefly it provides that in consideration of a certain price (usually 1*s.*) per bearing cacao tree which is to be paid the contractor at the end of a certain period (usually five years) and in return for ground provisions grown on the land in the meantime, the contractors enter into possession of the land for the specified period and undertake to plant and maintain in a husbandlike manner the cacao cultivation which is permanently to occupy the land.

The latter part of the handbook is devoted to a description of the neighbouring island of Tobago. The advantages of this Colony as an opening for the investment of capital are clearly indicated, but due warning is given to intending settlers to visit the various districts and become familiar with the local conditions before investing money.

The attractive nature of both Trinidad and Tobago as a colony for those in search of sport and the lighter pleasures appears to be as great as the opportunities afforded by these islands to intending agriculturists and men of commerce.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents and not to the Department.

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Agricultural News

Vol. XII. SATURDAY, APRIL 12, 1913. No. 286.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the subject of The Improvement of West Indian Pastures. The matter is dealt with from the point of view of the productive powers and hygienic characters of grass land.

On page 117 appears an article concerning the production of hydrocyanic acid in plants and seeds.

Under the caption Book Shelf, on page 119, will be found a review of West Indian Tales of Old and of a Handbook of Trinidad and Tobago.

The subject of root borers and other grubs in West Indian soils is continued from the last issue of the *Agricultural News* under Insect Notes, on page 122.

Recent results in connexion with soil sickness and partial sterilization are abstracted on page 123.

The Fungus Notes, on page 126, describe the present position in regard to the parasitology of the red rot fungus of the sugar-cane. Results obtained recently in the West Indies will be given in the succeeding issue of this journal.

The third and concluding article on Wattle Bark is presented on page 127.

Osmosis in Soils.

Hitherto the movements of water in the soil have been attributed to gravitation, capillary action and heat. To these must now be added osmotic pressure. Two abstracts in the *Journal of the Chemical Society* (February 1913) contain the results of recent work on soil osmosis by Hynde and Bates. The chief experiments consisted in determining the rise of water in clay cells of varying thicknesses fitted with capillary tubes. The pre-determined capillary rise of each solution was deducted from the total rise, the remainder being the osmotic rise. The osmotic pressures obtained with the thickest layers of clay were the highest, but the concentrations of the soil solutions were also highest in these cases. It is calculated that about two metres thickness of clay would be a perfect semi-permeable membrane. In all cases the osmotic rise at 36·5° was somewhat higher than at 16·7° C.

It is suggested that osmotic effects play an important part in agricultural operations, particularly on heavy clay subsoils. Tillage, drainage, manuring and mulching, by favouring bacterial action, increase the proportion of soluble matter in the soil, and therefore the amount of moisture which is raised osmotically through the subsoil. The same effect may be brought about by the addition of mineral fertilizers and such substances as gypsum and salt which are not directly plant foods.

The Trade of Dominica.

At a recent meeting of the Legislative Council of Dominica, His Honour the Administrator, in the course of an address, congratulated the Council on the steady progress made by Dominica during the past ten years.

He said the returns that had been furnished him showed that the total local trade of the island for the year 1912 was valued at £291,350 (£148,977 for imports and £142,373 for exports) compared with £243,241 (£142,536 for imports and £100,705 for exports) for the year 1911, and £177,542, the annual average total for the previous ten years.

The lime crop for the year 1912, as shown by the export returns, was calculated at 370,000 barrels, and would be the largest yet realized. Evidence of the steady growth of this staple industry was furnished by the fact that the lime crop of the island had doubled in ten years. For the three years 1903-5, the lime crop had represented an annual average of 172,000 barrels. For the next three years, 1906-8, the annual average crop had been 263,000 barrels, and for the three years 1909-11 the average crop had been 336,000 barrels. The value of the lime products of the island exported during the year 1912 was given at £96,673, compared with £73,883 for the previous year, and £53,841 the annual average for the ten years 1901-10.

Of the other exports of the produce and manufacture of the island for the year 1912, cacao was valued at £26,327 (an increase of £4,624 on the previous year); lumber at £11,488, and coco-nuts at £1,125.

The trade in fresh limes with the United States of America continued to be steady. During 1912, 35,046 barrels of limes had been exported to New York compared with 34,316 in 1911, and 25,509 in 1910, This trade had been built up from the shipment of 6,884 barrels exported to the United States in 1902. The trade in fresh limes with the United Kingdom and with Canada could not be said to be on a satisfactory basis; the exports last year to these places being respectively 1,323 and 301 barrels.

His Honour was advised that the lime and cacao crops of the island for the present year promised well, and that it was anticipated they would give a larger yield than during the past year. With the present market prices for these commodities, the prospects of the island were good.

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Maize with Silks Maturing before Tassels.

A discovery has been made in America of the proterogynous habit in a variety of maize introduced from Granada, Spain. In plants of this type the silks are exserted and receptive before the pollen begins to fall. In the publication where this information is presented (*Circular* No. 107, United States Department of Agriculture) it is further pointed out that the proterogynous characteristic insures a much larger percentage of cross-pollinated seed than is obtained in the ordinary varieties in which the falling of the pollen is simultaneons with, or precedes the exsertion of the silks. If this character could be combined with improved American types it would obviate the necessity of detasselling to secure cross-pollinated seed. A small quantity of pure seed of this variety has been produced during the past season in America, and is available for those wishing to undertake the introduction of this character into local varieties.

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The Watering of Cuts in Rubber Trees.

A paper has recently been published in the *Agricultural Bulletin of the Federated Malay States* (Vol. I, No. 7) which is important from two points of view. In the first place it contains results that are likely to be of practical value, and in the second place it affords an example of an original investigation that has been undertaken by a planter. The first experiment in the investigation was designed to show whether the commonly practised custom of watering cuts lengthened or shortened the duration of the dripping period. In round numbers it was found that when the cut was watered the tree continued to drip for eighty-one minutes, when the cut was rot watered, for 102 minutes: that when the tree was watered it yielded 250 drops, when not watered 510 drops. A second and more extensive experiment led to the astonishing conclusion that one thousand trees would give about ¾-lb. less rubber a day if water were poured on the cuts than they would give if the cuts were not watered.

The reason for this appears to be that the addition of water induces coagulation.

Formation of Resin.

In *Annales du Musée Colonial de Marsielle*, Vol. X, 1912, appears an interesting paper by Jadin and Juillet on their research into the anatomy of three species of Kalanchoë of Madagascar. The genus Kalanchoë belongs to the natural order Crassulaceae which is closely related to the Cactaceae. To the Crassulaceae also belongs the genus Bryophyllum which has a representative in the West Indies, *Bryophyllum calycinum* (love bush).

The stems of the species of Kalanchoë examined contain scented resin, and the most interesting feature of the investigation was the study of its formation which begins with the suberization (or cork-formation) of the layer of cells immediately below the epidermis or skin. For some time the nuclei of these thickened cells remain alive, but eventually they disappear and their place is immediately taken by the scented resin. Sometimes this substance appears in the interior cells of the stem, but it is them immediately replaced by large crystals of calcium oxalate.

The suberization and resin-formation function as xerophytic characters to provide against excessive transpiration It is not stated whether the resin is of any economic value.

◆

Identification of Vegetable Oils.

The following methods for the identification of two important vegetable oils appears in the *Agricultural Ledger* 1911-12—No. 5.

Dealing first with cotton seed oil it is pointed out that this is readily recognized by the high melting and solidifying points of its fatty acids. There are also certain colour reactions which are employed in analysis. The Halpen colour reaction is the best, and is applied as follows: 1 to 3 c.c. of oil is dissolved in an equal volume of amyl alcohol; to this is added 1 to 33 c.c. of carbon bisulphide holding in solution 1 per cent. of flowers of sulphur. The test tube containing the mixture is then immersed in boiling water. The carbon bisulphide evaporates off, and the cotton seed oil gives in the course of five to fifteen minutes a deep red colouration. This reaction is very characteristic, and it is possible to detect thereby 5 per cent. or even less of cotton seed oil in admixture with other oils and fats. Kapok oil (from *Eriodendron anfractuosum*) possesses similar properties but its fatty acids melt at a rather higher temperature (41°C.).

Arachis oil from the ground nut (*Arachis hypogaea*) can be identified and detected by the isolation of arachidic acid, a constituent melting at 74·5°C. About 10 grams of the oil is saponified, neutralized and treated with lead acetate. The lead salt is extracted with ether, the insoluble portion is decomposed, and the fatty acids dissolved in 50 c.c. of 90 per cent. hot alcohol. On cooling the alcoholic solution, a crop of crystals will be obtained which should amount to 5 per cent. of the oil, and should melt between 74° and 75·5°C.

INSECT NOTES.

ROOT BORERS AND OTHER GRUBS IN WEST INDIAN SOILS.

As was promised in the last issue of the *Agricultural News*, the account of boring insects belonging to the group Rhyncophora, is now continued as follows:—

The root borer of the sugar-cane in the Leeward Islands (*Exophthalmus esuriens*). Reference: *Agricultural News*, Vol. XI, p. 298.

In a few instances in Antigua and frequently in one locality in St. Kitts a weevil grub has been found attacking mature canes in a manner exactly similar to that in which the larvae of *Diaprepes abbreviatus* attack the same plant in Barbados. The larva found in the Leeward Islands is similar in general appearance to that which occurs in Barbados, but Diaprepes is not known to exist either in St. Kitts or Antigua. In these islands, however, a weevil (*Exophthalmus esuriens*) is to be found very commonly among the leaves of pigeon peas, castor and French silk cotton (*Calotropis* sp.). Exophthalmus compared with Diaprepes is somewhat smaller, and of a uniform greyish-brown colour in contrast to the handsome markings of the latter. The relationship as adult and larva of the same species, between this weevil and the root borer of the cane in the Leeward Islands has not been proved, but the evidence so far available strongly indicates this relationship.

The eggs are laid in the same manner as, and greatly resemble those of Diaprepes, and when deposited on leaves of castor, are protected by a fold of the leaf stuck down in the same manner as in the case of Diaprepes. The eggs of Exophthalmus have not been observed on leaves of sugar-cane.

Exophthalmus esuriens occurs in St. Kitts, Nevis, Antigua, Montserrat and Dominica.

The extent of the injury caused by the attacks of root borer on canes in Antigua and St. Kitts is not known, but the fact that planters generally are not aware of the presence of this insect in their fields, would indicate that this is not great at the present time, although it is probably greater than is suspected. The first observations recording the attacks of this insect appear to have been made by the Entomologist on the staff of the Imperial Department of Agriculture, in Antigua in 1911, and in St. Kitts in 1912. It is very probable that this insect will prove a more serious pest in later years than it has done in the past, and also that when planters learn to recognize this form of injury, it will be found in many instances to account for what has in the past often been attributed to the effects of drought and the ravages of fungus disease. The insect now known as *Exophthalmus esuriens* was formerly referred to in the publications of the Imperial Department of Agriculture as *Epicaerus ravidus*, especially with reference to its occurrence in Montserrat where it is abundant, and has attracted attention from the fact that the adults are often to be found on lime trees, feeding on the leaves. This insect is known in Montserrat by the common name of hard-back.

No parasite of the root borer in the Leeward Islands is known. The methods of control to be used against this insect in the event of a severe attack would be the same as those suggested in the case of *Diaprepes abbreviatus* in Barbados.

The fiddler beetle (*Praepodes vittatus*). References: *Agricultural News*, Vol. IV, p. 316; *Bulletin of the Department of Agriculture*, Jamaica, November 1903, October 1905.

The fiddler beetle is a large weevil, marked with black and white stripes on the wing covers (one variety has a red stripe down the middle of the back). The larvae attack the roots of orange trees in Jamaica, often girdling them and thus causing their death. This is similar in kind to the attack of Diaprepes grubs on cacao in St. Lucia, already mentioned.

Various methods have been suggested for dealing with the fiddler beetle, chief among which are the following: Avoid planting too deep, and do not cultivate provisions or similar crops between the orange trees, since the open nature of well tilled soil offers easy opportunity for the beetles to penetrate into the ground and gain access to the roots. From what is known, however, of the strength of similar insects in both larval and adult conditions, and their ability to penetrate hard, closely packed soil, this last would seem to be only a mild preventive.

The fiddler beetle is said to be parasitized by a large black wasp (*Elis atrata*). This insect belongs to the Scoliidae, a family of solitary, burrowing wasps, which lay their eggs on or in the bodies of certain soil-inhabiting grubs, after these have been partially paralyzed by stinging.

The golden weevil or orange leaf weevil (*Diaprepes spengleri*). References: *Agricultural News*, Vol. III, p. 202; *Annual Reports*, Porto Rico Experiment Station, 1905, 1906, 1907.

This insect in size and shape is very similar to *D. abbreviatus*, the root borer beetle in Barbados, but its bright golden yellow colouring distinguishes it at once. *D. spengleri* seems to be known only in St. Vincent and Porto Rico, and in both these places only the adults are recorded. The larvae and their food and feeding habit are apparently unknown in St. Vincent. In Porto Rico, the larvae attack the roots of the orange, and also feed on roots of guava, avocado, mango and rose. The adults are noticeable from their habit of feeding on the leaves of certain plants, among them limes and other citrus trees, pigeon peas, castor and several cruciferous plants. In Porto Rico, the injury to orange trees caused by this insect has been especially noticeable on young trees newly planted out, and at times this has been sufficiently severe to render advisable spraying with arsenate of lead.

In the Virgin Islands, a small yellow weevil (see *Agricultural News*, Vol. XII, p. 42) seemingly related to *Diaprepes spengleri* is known to occur, and in Montserrat one specimen of a species has been found, closely related to *D. abbreviatus*. Nothing more appears to be known of these two insects.

In the next issue of the *Agricultural News* the continuation of the present subject will concern the family of beetles known as hard-backs.

THE BALSAM TREE OF VIRGIN GORDA.

The attention of this Department was first called to the interesting characteristics of the Balsam tree by the Hon. W. H Porter, Treasurer of Dominica, who wrote in August 1912 as follows: 'There grows at the famous natural baths at Virgin Gorda (in the Virgin Islands) a small tree known locally as balsam which resembles in character 'cashew', and is to my knowledge well over fifty years old. It grows amongst the enormous boulders which forms the "baths" (at some distance, as far as I can ascertain, above the ground) and has an enormous root system striking down to the sandy soil beneath. The leaves are rather fleshy when growing, and visitors to the baths usually record the event on the leaves for the benefit of persons coming after. I plucked some such inscribed leaves, still green and fresh eighteen months after the date appearing on them. In the dry climate of

Virgin Gorda, the fallen leaves appear to decay but slowly, and inscriptions on such may be deciphered long after they have been shed and dried.

'The seeds contain a pitchy resin, which is used for caulking the seams of boats, for which purpose it is said to be the equal of asphalt. This resin is recovered in an ingenious manner. The seeds are set in an ordinary Dutch stove, or "coal pot" and set alight, burning readily of course. The melted resin flows down through the grate, and is collected in the ash chamber below.'

With a view to obtaining further information on the subject and fresh specimens, the Curator of the Botanic Station of the Virgin Islands was communicated with. The botanical name of the tree was not known locally, though several specimens of the tree were stated to occur in the islands, and the properties of the seeds were also familiar.

Eventually, specimens of the leaves and fruit of the tree were received from the Virgin Islands and forwarded, together with the information given above, to the Royal Botanic Gardens, Kew, for identification.

Recently a communication from the Assistant Director states that the tree proves to be *Clusia rosea*, Jacq. (N. O. Guttiferae). No sample either of the seeds or of the resin was found in the Kew collections, and accordingly specimens will be forwarded in due course from this Department for inclusion in the Kew museum.

SOIL-SICKNESS AND PARTIAL STERILIZATION.

The recent endeavours to deal with cases of soil-sickness by means of partial sterilization have arisen from the discovery, some few years ago, that this treatment increases bacterial activity in the soil mainly through the reduction of the number of larger competing organisms (protozoa). The change in the flora of the soil thus brought about, increases the production of plant nutrients, and hence influences favourably the growth of cultivated crops. An interesting account of this side of the subject will be found in the following references: *Agricultural News*, Vols. IX, pp. 33 and 107; XI, pp. 131 and 166, where an account is given of the original Rothamsted work, and a description included of curious sterilization practices in India.

The present article is written with special reference to a paper by Russell and Petherbridge, which appears in the *Journal of the Board of Agriculture*, for January 1913. This paper, which is entitled 'Partial Sterilization of Soil for Glass-house Work', describes the results of experiments in continuation of previous ones, to be found in the *Experiment Station Record*, Vols. XXII, p. 121; XXVI, p. 815, XXVII, pp. 620 and 621. Reference to this literature will show that during the last year or two, attention has been given to the matter of partial soil sterilization mainly from the pathological aspect. The healthy or unhealthy nature of the soil, and not merely its supply of plant nutrients, has been the central object of investigation.

It has been established in the United States, the Transvaal, as well as in England, that the so-called sick soils can, in many instances, be rendered healthy by subjecting them to a temperature of 100°F. to 200° F. or by means of the application of antiseptics. The latest information on the subject, contained in the paper by Russell and Petherbridge, referred to above, deals mainly with the application of antiseptics in practical horticulture. Sick soils to tomatos, cucumbers, vines, ferns, peas and tobacco received special investigation.

It might be pointed out at once that by a tomato sick soil is meant a soil that induces in tomato plants grown in it, a pathological or diseased condition of so serious a nature that their cultivation ceases to be profitable. It is of the greatest importance to bear in mind that it is not the crop that causes sickness of the soil, but the soil that causes sickness of crop. There are some virgin soils, for instance, in which vines cannot be grown without artificial treatment. That treatment is partial sterilization. In garden or nursery work, heating of the soil is not likely to be so convenient as the application of antiseptics; for glass house or pot-work, however, the heating method can be employed with commercial success. Of the common antiseptics, carbolic acid, calcium sulphide and formaldehyde have given good results—even better than those results obtained previously by using toluol. The selection of an antiseptic is controlled by several factors for example, efficiency, original cost and expense of transport, and has to be settled by considering the conditions of each particular case. But the fact remains that their use cures the sickness, kills the disease organisms in the soil, and incidentally increases the supply of plant food. What the different sicknesses really are is not at present definitely known: it may be that toxic or poisonous substances (to the particular crop affected) occur in the soil as the excretions of certain fungi and bacteria. Sometimes the sickness can be, in part, attributed to the presence of 'damping off' fungi like the widely spread Pythium and Rhizoctonia. Future investigations will in all probability reveal the exact causes in every case.

In concluding these considerations, it may be remarked that the possibility of the local application of partial sterilization to certain West Indian soils seems to be suggestive, and the subject will also bear consideration in connexion with specific root diseases. A remedy for these may lie in the partial sterilization of the soil.

Animal Nutrition: Recent Results.—Armsby and Fries have shown that there is an increase of metabolism (building up and breaking down of food in the body) in cattle when they are in a standing, as compared with a lying, position. The increased emission of heat during the standing periods is accompanied by a corresponding elimination of both carbon dioxide and water. Working on the tolerance for sugar in the pig, Carlson and Drennan have found that slow but fatal diabetes occurs in the pig after removal of the pancreas. The pig was found to have a lower tolerance for dextrose than any species so far studied, that is it becomes glycosuric (secretes glycogen or animal starch) when quite small amounts of sugar are given by the mouth. Perhaps the most interesting of recent work is that of Reale on carbon metabolism. This investigator estimated by a wet oxidation process (with chromic and sulphuric acids) the amount of carbon in urine. It was found that only about half the carbon in the urine exists in the form of urea. It was also discovered that a part of the carbon is readily oxidized to carbon dioxide in the presence of hydrogen peroxide when manganese peroxide is used as a catalyst. This is designated by the author 'labile carbon,' whereas the carbon which is not so oxidized is called 'stable carbon'. Interesting results have also lately been obtained by Moldoven on the method of action of quinine on trypanosomes. Separation of droplets of lipoid character occurs, producing a change in the osmotic relationship of the protoplasm to its surroundings. Final cause of death is stoppage of oxygen respiration. (From the *Journal of the Chemical Society*, for February 1913.)

GLEANINGS.

The Leeward Islands *Government Gazette* for March 13, 1913, contains a draft of a Bill which is designed to regulate the importation into, and the storage and disposal of, opium, morphine, cocaine, and similar drugs in the Presidency of Antigua.

The British Government propose to introduce a Bill which will authorize the Treasury to guarantee payment of interest on a loan to be raised by the Government of the Sudan to the extent of three millions, for the purpose of developing the Egyptian cotton industry.

The Antigua *Sun* for March 11, 1913, contains an account of the first meeting of the Antigua Horticultural Society. Preliminary matters of organization were discussed at this meeting and expressions made of the benefits that are likely to accrue from the establishment of the society.

According to *The Board of Trade Journal* for March 6, 1913, a suitable opening exists for the cultivation of rubber in the Kasai district of the Congo. The most fertile land lies along the banks of the rivers, and may be purchased from the State at the minimum price of £40 per hectare (about £16 per acre).

The output of sugar from Barbados during the past three years has been as follows: 1909, 40,375 hogsheads; 1910, 59,771 hogsheads; 1911, 54,411 hogsheads. The crop was therefore appreciably less than that for the previous year but still greatly in excess of that for 1909. (From *Colonial Reports*, Annual, No. 748.)

A resolution was unanimously carried at a recent meeting of the Antigua Agricultural and Commercial Society regarding the necessity for taking steps towards preserving existing trees in the island, and increasing the area under timber, both for the purpose of conserving water-supply and for providing adequate supplies of timber as required.

An account is given in the *Journal of the Royal Society of Arts* (March 7, 1913) of a sun power plant which has been erected on the banks of the Nile. This machine is used for pumping water for irrigation purposes from that river, and is provided with five reflectors mounted on steel frames 204 feet long, with an area of 13,500 sq. feet, and 20 feet apart. There is an automatic movement of the mirrors which is actuated by a thermostat, and causes them to maintain a constant position relative to the sun. In the middle of each reflector is the boiler, heated by the concentrated rays of the sun in such a manner as to raise steam to a pressure of 100lb. to the square inch.

A lecture was given in Barbados on April 1, 1913, by Dr. Anderson, of the University of Oxford, on the subject of the Transmission of Tropical Diseases by Insects. The lecture was well illustrated by lantern slides of microscopic preparations. The chair was taken by Dr. Francis Watts, C.M.G., Imperial Commissioner of Agriculture for the West Indies.

Sugar-cane is at present one of the most remunerative crops under cultivation in Paraguay. It would doubtless be more extensively grown if labour conditions could be depended upon. The greater part of the sugar produced is used in the manufacture of rum, but in one district there is a large factory for the manufacture of crystal sugar. (From *Diplomatic and Consular Reports*, No. 5040—Annual Series.)

A letter which has recently been received at this office contains the information that a large 300-ton hand-power patent baling press has lately been completed for the Government of India. This press, which has been tested and approved, has a Robert's patent swinging box, and is worked by a winch fitted with long handles for sixteen men. It is capable of turning out 27 bales per day of eight hours.

Information has been received from the editor of *Tropical Life* to the effect that seven gold medals will be offered by that journal for competition at the Rubber, Fibres and Cotton Tropical Products Exhibition, to be held in London during June 1914. Enquiries should be addressed to Mr. A. Staines Manders, Organizing Manager, 75, Chancery Lane, London, W.C. In no case should enquiries be addressed to *Tropical Life*.

The *Garden and Field* for February 13, 1913, states that of the 100,000,000 horses known to exist in the world, 80,000,000, or four-fifths of the entire number are found in the temperate zone; the remaining 20,000,000, scattered through the tropics, are largely employed in the service of temperate zone visitors or residents. In the United States and Canada there is said to be one horse for every 372 persons; in South America there is only one for every seven.

Notice of Judgement No. 1983 of the United States Department of Agriculture describes a case of adulteration of milk which was proceeded against under section 4 of the Foods and Drugs Act. A sample of milk was found to contain 26,000,000 bacteria per cubic centimetre, plain agar, after two days at 37° C. More detailed analysis made it evident that the sample was composed in part 'of a filthy, decomposed, and putrid animal substance,' and the court imposed sentence to be satisfied on payment of $37·50.

The *American Sugar Industry*, for March 1913, contains a note on the so-called Hoffman method of water determination applied to honey. It was found that by distilling 50 grams of honey with 200 c.c. of oil of turpentine in a 500 c.c flasks, results were obtained identical with those got by drying the honey on sand for nearly thirty hours in a vacuum pan at 60°C. This method would seem to be valuable chiefly as a rapid control, since it requires rather too much attention where many routine determinations have to be made.

STUDENTS' CORNER

APRIL.

Second Period.

Seasonal Notes.

At this time of year lime nurseries will probably need careful attention. In some districts the plants may be suffering from drought. The bad effect may be lessened by maintaining a mulch of loose soil on the surface, also the amount of moisture lost may be reduced by covering the surface with trash. What effect does this have upon the temperature of the soil, and how does this influence the retention of water? On the plantations, the trees will be blossoming or will lately have blossomed, and in this connexion observations should be made to determine the influence of situation. In exposed localities a low yield of fruit is occasioned by the destruction of flowers by the wind, and this emphasizes the importance of wind-breaks. In dry localities it is probable that a certain degree of shade is advantageous, whereas under moist conditions abundant sunlight is always desirable for vigorous growth and fruit production. Moist conditions are not entirely regulated by the amount of rainfall: the retention of water in the soil—particularly in the subsoil—the humidity of the atmosphere and presence of clouds have an important bearing upon the conservation of rainfall, and must accordingly be considered in conjunction with the precipitation of rain itself.

Attention will soon have to be given to the preparation of land for cotton and sugar-cane. In some districts the early planting of cotton is safer owing to weather conditions and insect attacks. On estates where cotton is grown over a large acreage, before the cane is planted, it will be advisable to supply the new cane crop with quick-growing varieties so that the disadvantage of late supplies may not be felt later when the crop is reaped. What varieties of cane germinate quickly, and what varieties germinate slowly?

The planting of provision crops will also have to be considered. Care must be exercised in the selection of the best cuttings, and the land must be got into proper condition in order that planting may be proceeded with at once on the receipt of rain.

The editorial in this issue of the *Agricultural News* should be read carefully and compared with a former leading article on A West Indian Herd Book (see *Agricultural News*, Vol. XII, p. 81). It will be seen that the improvement of live stock and the improvement of pastures are closely connected. In these columns in the last number of this journal it was suggested that observations might be made on the general characteristics of good class working cattle. This may be extended to the matter of susceptibility of certain animals to tick infestation. Notice any differences between the nature of the hide of a nearly or quite pure bred Zebu animal and that of an animal partly descended from some European breed or breeds.

More directly in connexion with the improvement of pastures read an account of West Indian grasses in the *West Indian Bulletin*, Vol. IV, p. 353, and also the note on the selection of devil's grass in the *Agricultural News*, Vol. XII, p. 41. Examine pastures for leguminous plants and grow those found in boxes with a view to observing their characteristics.

Interesting specimens of pasture plants may be forwarded to the local agricultural department for further examination.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Compare with the aid of line drawings the root system of a lime and cacao seedling.

(2) How many teeth has a three-year-old horse and a three-year-old cow? How many incisers and molars are are there in each animal?

INTERMEDIATE QUESTIONS.

(1) Given an area of land for cane cultivation, would it pay better to plant (a) half in plant canes each year leaving half in ratoons, or (b) three-fifths in plants, one-fifth in ratoons and one-fifth bare fallow? Discuss the matter from a practical aspect.

(2) What field implements correspond to the following tools: spade, fork, rake, garden hoe and roller. Describe accurately the work done by these implements, and give the reasons for the beneficial results that accrue from their employment.

FINAL QUESTIONS.

(1) What is the difference between a parasitic fungus and a fungus parasite? Write a short essay on the utilization of fungus parasites in ordinary estate practice.

(2) In proceeding to drain a field, what would be the considerations that would guide you in deciding upon the course of the drains, their size, depth, distance apart, and the outlet?

An Appreciation of St. Vincent.—During the visit to St. Vincent, Her Highness Princess Marie Louise of Schleswig-Holstein took much interest in the Botanic Gardens, and in order to leave behind in them a record of her visit, Her Highness on the 4th instant, in the presence of a large gathering planted a mahogany tree.

In the Leeward District Her Highness visited the Linley Valley estates and stayed at Belmont Rest House. She appeared much interested in the agricultural progress on these Land Settlement estates. Her Highness also evinced a keen interest in the industries of the Colony, more particularly in the Sea Island cotton and arrowroot cultivations, and took away samples of these products as mementos of her stay in the island.

The Princess rode on horseback for the greater part of each journey, and therefore brought herself into close touch with the inhabitants of most of the small towns and villages, as well as with the gorgeous tropical scenery and vegetation of the mountains and valleys from the Falls of Baleine, situated near the most northerly point of the island on the Leeward coast, to Orange Hill estate in the Carib Country on the Windward side.

DEPARTMENT NEWS.

The Secretary of State for the Colonies has been pleased to confirm the appointment of Mr. W. R. Dunlop as Scientific Assistant on the Staff of the Imperial Department of Agriculture, in succession to Mr. A. H. Kirby promoted to Southern Nigeria.

FUNGUS NOTES.

RED ROT FUNGUS AND THE SUGAR-CANE IN THE WEST INDIES.

Part I.

The conflicting views to be found in the literature dealing with the parasitology of the red rot fungus (*Colletotrichum falcatum*) rendered it desirable to carry out in St. Kitts and Barbados the series of inoculations to be described in a later article, with the object of determining as definitely as possible, under West Indian conditions, (a) the chief mode of infection in the case of the growing cane; (b) the possibility of infection by means of diseased cuttings of different varieties, (c) the rate of development of the disease and the conditions of susceptibility and resistance to it on the part of the host plant.

The experiments were arranged during August 1912, and carried out during the following six months by F. W. South, Mycologist to this Department, and W. R. Dunlop (now Scientific Assistant).

Before proceeding to a description of these experiments, it is necessary to refer first to previous work on the same subject in other parts of the world, and to indicate the position that existed before the commencement of the present investigation.

PREVIOUS WORK.

The earliest inoculations with *C. falcatum* were made by Went, in Java. The introduction of the fungus by means of pin picks produced the characteristic symptom of a white spot in reddened tissue after ten days. In 1901, C. A. Barber, in India, described the disease (*Bul. Depart. of Land Records and Agr.*, Madras, No. 43, 1901) as being parasitic in one district and saprophytic in another. In cases where the infection was considered to be due to infestation with moth borer (*Diatraea saccharalis*), this author found the symptoms confined to a single node. Barber also noticed the presence of more natural cracks in Indian canes than in those of the West Indies, but did not consider this condition responsible for infection. He was inclined towards the view that infection took place through diseased cuttings, though apparently he did not conduct any definite experiments to prove it.

About the same time Tryon, in Queensland, stated (*Queensland Agr. Journ.*, July 1901) that *C. falcatum* was there a faculative parasite, and referred to the observations of Gage in Bengal, who found that fifty-eight out of sixty five cases of diseased canes were attacked by shot borer (*Xyleborus* sp.). Later on, Howard contended (*Annals of Bot.*, Vol. XVII, No. LXVI, March 1903) that *C. falcatum* was the active parasite in rind disease, and that *Melanconium sacchari* was a saprophytic follower of *C. falcatum*. In 1906, important inoculation experiments were conducted by Lewton Brain in Hawaii (*Bul. Dir. Path. and Phys. Hawaiian Exp. Stat.*, No. 8), in which he proved that infection could not take place through the cane leaf. Inoculated canes gave a red discoloration in the entire node, but no white central area after two months. This investigator also observed that there was no extension of the diseased area after twelve months, nor was any white spot produced. These experiments were conducted on Caledonian variety. The chief damage was shown to be caused by the secretion of invertase by the fungus, thus increasing the glucose ratio. The same author concluded that the disease might be perpetuated by the planting of infected cuttings.

About the same time, Butler, in India, pointed out (*Mem. Dep. Agr.*, India, Vol. I, No. 3, July 1906) that *C. falcatum* was associated there with moth borer. Bourbon variety was particularly susceptible to the disease. It was concluded by this author that the disease was carried by sets or cuttings. Maublanc and Delacroix, writing in *Agr. Prat. des Pays Chauds*, No. 90, 1910, described *C. falcatum* as a wound parasite which might arise from infected cuttings. In 1911, Kulkarni, in India, stated (*Bul. Dep. Agr.*, Bombay, No. 44), that his experiments showed that infection by planting diseased sets was by far the commonest form of communication. Slab experiments failed to prove infection in moth borer holes. During the same year Butler reported (*Ann. Report Agr. Stat.*, East Bengal and Assam, 1911) that the West Indian canes B.147, B.1753, B.376 had been found to be resistant to red rot in India, but B. 208 was found to be susceptible.

Early in 1912, the subject received considerable attention by American workers. Edgerton's results (*Mod. Sug. Plant.*, Jan. 27, 1912) entirely negatived infection from diseased cuttings. Leaf trace infection was considered possible but unlikely. This investigator worked with Purple and Striped Californian varieties, and with D.75 and D.95. The Californian canes were found to be more susceptible than the Demerara ones. In the case of the inoculations on the former, the disease spread through two to five joints during the season, whereas in the case of the Demerara cuttings the disease spread during the same period through only one to two joints. The largest number of infections in a diseased field were attributed to *Diatraea saccharalis*. Of the canes attacked by this borer 50 per cent. contained *C. falcatum*.

More recently Johnston, in Porto Rico, emphasized (*Sec. Ann. Report Exp. Stat. Sug. Prod. Assoc.*, Porto Rico) the close relationship between *C. falcatum* and climatic conditions and presence of moth borer respectively. This author observed that under-ripe canes were more resistant than over-ripe. The disease was noticed to be very severe on mature D.625 canes free from moth borer, also on over-ripe Otaheite suffering from drought and on canes badly infested with moth borer. It was considered probable that *C. falcatum* on leaf sheaths might kill the leaves, but not infect the cane. Bordeaux mixture was found to be useful as a preventive of infection of cuttings during germination under conditions of drought.

During the same year (1912) South and Dunlop observed *C. falcatum* on B.147, hitherto a very resistant variety, in St. Kitts. The disease was chiefly prevalent in fields where this variety had been grown continuously for some years. Conditions of drought had also prevailed and moth borer and shot borer were present in large numbers. Ballou was of opinion that the shot borer did not attack canes free from *C. falcatum*. He considered it probable that the insects were attracted by the smell of the fermentation set up by the fungus.

Quite recently, in British Guiana, Harrison and Stockdale (*West Ind. Bull.*, XIII, No. 2) have emphasized the fact that in every variety of sugar-cane there is a tendency towards running out, which may be partly the cause, or partly the effect of the prevalence of red rot disease. These investigators have pointed out the fact that the older ratoons of D.625 (the seedling itself being moderately resistant) are as susceptible to disease as D.4399 and D.4407 which are seedlings of, and resemble in susceptibility, the Bourbon cane.

From the references that have been given above it will be seen that the position in regard to the parasitology of

C. falcatum is so far extremely complicated; it may be summed up as follows:

(a) The fungus is a faculative wound parasite chiefly harmful owing to its invert action on cane sugar but under certain conditions may also occasion a reduction in the yield of cane.

(b) The degree of virulence varies greatly according to climatic conditions, age, and particularly with the variety of cane.

(c) The chief mode of infection appears to be through the agency of boring insects. This is open to question in the East, but highly probable in the Western Tropics.

(d) The perpetuation of the disease through diseased cuttings is probable in the East but improbable in the Western Tropics.

In the succeeding issue of the *Agricultural News*, an account of South and Dunlop's experiments will be proceeded with to show the extent to which their results agree with those included in the above summary.

WATTLE BARK.

III.

The following is the concluding article of the three on this subject that have been promised for the *Agricultural News*. It deals with the exploitation of the bark, returns to be expected and by-products, and gives some account of diseases of the trees

EXPLOITATION OF THE BARK. In the last reference but one, above, it is stated that wattle bark is made up for export in 3-℔. Hessian bags, each containing 200 ℔. of the bark. From the chief exporting countries (according to *Bull. Imp. Inst.*, IX (1911), 2, 116), the quantities and values of the shipments were as follows: Natal (1909), 705,848 cwt. and £192,950; Cape Province (1909), 9,572 cwt. and £1,746; Australian Commonwealth (1908 and probably including some mallet bark), 260,364 cwt. and £102,410. In these cases, the export is increasing, except from Australia where it is decreasing. When these matters are considered, it must be remembered that (as has been indicated already) there is the probability of a large future supply from German East Africa, and that this is the case also of the British East Africa Protectorate. In the latter place a Wattle Bark Industry Ordinance was enacted last year, for protecting the industry (*Bull. Imp. Inst.*, X, 3, 479).

The United Kingdom and Germany are the chief consumers of wattle bark, the latter country taking by far the larger amount, as is shown by the fact that the imports into Hamburg, in 1909, were 426,982 cwt., value £195,398.

It is of some interest in the West Indies that a large demand for wattle bark has arisen in Canada (*Natal Agric. Journ.*, XII (1909), 3,270). On page 558 of the same volume of the journal just mentioned, reference is made to a serious shortage of the bark in Victoria, which was causing leather manufacturers in the State to restrict their output.

In *Bull. Imp. Inst.*, IX (1911), 2,119, a comparative statement is given which makes it clear that: 'wattle bark is a very cheap tanning material when its actual cost is compared with those of the materials it would probably replace in the tan-yard, viz. valonia in the United Kingdom, and quebracho wood in Germany.'

The general conditions of the exploitation of wattle bark cannot be better summarized than by giving the following short statement of its advantages that appears near the end of the article just quoted: '(1) it is being produced in increasing quantities so that there is no danger of a failure in supply, (2) it is being cultivated in several different countries so that no monopoly in production is likely to occur, (3) it is produced mainly in British Territories having rapid and regular means of communication with the United Kingdom, (4) it presents, as marketed, very little variation in quality, (5) it is rich in tannin, (6) it is cheaper than good tanning materials of similar quality, and properties, (7) the tannin it contains is easily extracted, (8) the bark can be extracted and used with great advantage in admixture with other materials, and (9) whilst it is best used for tanning heavy leathers it can be used for certain kinds of light leathers.'

RETURNS TO BE EXPECTED. Little information regarding these is available. Trees planted 6 feet by 12 feet would give 605 plants to the acre. One of the articles quoted already (*Agric. Journ. Union of South Africa*, IV, 5, 668) gives a yield of 30 ℔. of wet bark from each tree; that is, about 20 ℔. of dry bark. Reckoning 600 trees to the acre, this would mean a weight of dry bark per acre amounting to something over $5\frac{1}{3}$ tons. At £6 per ton, which is the price given in the article just mentioned (lower than the usual prices for bark from Australia), this would mean a return of £32 per acre. This article also states that Australian authorities estimate the yield at £35 to £45 per acre, and gives the further information that the current prices (November 1912) of wattle bark at Durban were £2 10*s*. to £7 per ton.

BY-PRODUCTS. The only by-product of importance is the wood, which is used for mining-timbers. A suggestion for its employment as a source for paper pulp is dealt with in *Technical Reports and Scientific Papers*, published by the Imperial Institute, p. 314; success is not predicted for the use of the wood in this way. Another suggestion, from Natal, is its distillation for the production of wood alcohol and acetic acid (*Bull. Imp. Inst.*, VI, 2, 161).

DISEASES. From a statement in *Agric. Journ. Union of South Africa*, II, 5, 693, by the Government Plant Pathologist, it appears that young black wattle trees in Natal sometimes suffer from gumming; death may be caused by this means, which requires further investigation before the true cause can be known.

Some of the most recent organized work in the subject has been done by Petch, who (*Circs. and Agric. Journ. Roy. Bot. Gard., Ceylon*, V, 10, 89) describes two root diseases of *Acacia decurrens*: one (*Armillaria fuscipes*) killing young trees used as wind-breaks in tea plantations; and a second (*Fomes australis*) which gradually kills old trees. The remedy suggested is the uprooting and burning of the affected trees.

Transmission of Colour in Cattle.—The following interesting facts concerning the transmission of colour and colour markings in Hereford-Shorthorn crosses, is taken from the *Experiment Station Record*, for December 1912.

'The circle around the eyes would seem to go with the solid red colour, as the greater number of red calves carry the characteristic eye circle. The fact that out of sixteen roan calves fifteen have no red markings on face (having only imperfect eye circles) strongly points to the dissociation of eye circles with roan colour. The cross of red and white results in roan, and the roan cow, having received red from one parent and white from the other, transmits the red to about half her offspring and roan to the other half, so that about half the calves from a roan cow bred to a Hereford bull, will be red, and the other half roan.'

MARKET REPORTS.

London.—The West India Committee Circular, March 25, 1913.

Arrowroot—3⅞*d.* to 5*d.*
Balata—Sheet, 3/2 ; block, 2/2 per lb.
Beeswax—No quotations.
Cacao—Trinidad, 74/- to 81/- per cwt. ; Grenada, 66/- to 71/-; Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—West Indian, £30 5*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 19½*d.* to 24*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 1/6 to 1/8; concentrated, £25 5*s.*; otto of limes (hand-pressed), 10/6.
Logwood—No quotations.
Mace—1/9 to 2/9.
Nutmegs—5¾*d.* to 6½*d.*
Pimento—2⅛*d.* to 2⅜*d.*
Rubber—Para, fine hard, 3/11; fine soft, 3/10½; Castilloa, 3/6 per lb.
Rum—Jamaica, no quotations.

New York.—Messrs. Gillespie Bros. & Co., March 21, 1913.

Cacao—Caracas, 15c. to 15½c.; Grenada, 14½c. to 15c; Trinidad, 15c. to 15½c. per lb.; Jamaica, 12½c. to 13½c.
Coco-nuts—Jamaica, select, $33·00 to $34·00; culls, $18·00 to $19·00; Trinidad, select, $33·00 to $34·00; culls, $18·00 to $19·00 per M.
Coffee—Jamaica, 12c. to 15c. per lb.
Ginger—8¼c. to 11c. per lb.
Goat Skins—Jamaica, 52c.; Antigua and Barbados, 48c. to 50c.; St. Thomas and St. Kitts, 46c. to 48c. per lb.
Grape Fruit—Jamaica, $1·25 to $3·00.
Limes—$4·25 to $6·50.
Mace—46c. to 55c. per lb.
Nutmegs—110's, 13c.
Oranges—Jamaica, $1·75 to $2·50 per box.
Pimento—4c. per lb.
Sugar—Centrifugals, 96°, 3·58c. per lb.; Muscovados, 89°, 3·08c.; Molasses, 89°, 2·83c. per lb., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., March 31, 1913.

Cacao—Venezuelan, $15·00 per fanega; Trinidad, $14·25 to $14·60 per fanega.
Coco-nut Oil—96c. per Imperial gallon.
Coffee—Venezuelan, 15c. per lb.
Copra—$4·50 per 100 lb.
Dhal—$3·75 to $4·00
Onions—$1·50 to $3·00 per 100 lb.
Peas, Split—$6·00 per bag.
Potatoes—English, $1·25 to $1·75 per 100 lb.
Rice—Yellow, $5·25 to $5·40; White, $6·75 to $7·00 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., March 22, 1913; Messrs. T. S. Garraway & Co., March 22, 1913; Messrs. Leacock & Co., March 28, 1913.

Arrowroot—$6·00 to $7·50 per 100 lb.
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Rice—Ballam, $5·20 to $5·25 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $4·00 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, March 29, 1913; Messrs. Sandbach, Parker & Co., March 28, 1913.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	—	—
Balata—Venezuela block	No quotation	Prohibited
Demerara sheet	70c. per lb.	—
Cacao—Native	18c. per lb.	19c. per lb.
Cassava—	60c.	—
Cassava Starch—	$6·50	—
Coco-nuts—	$16 to $20 per M.	$10 to $16 per M.
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Green Dhal	$5·00	—
Eddoes—	72c. to $1·00	—
Molasses—Yellow	None	—
Onions—Teneriffe	—	—
Madeira	7c. to 8c. per lb.	6c. to 8c. per lb.
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Marseilles	—	—
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Potatoes—Nova Scotia	$2·60	$2·80
Lisbon	—	—
Potatoes-Sweet, B'bados	$1·00 per bag	—
Rice—Ballam	No quotation	—
Creole	$4·75 to $5·00	$5·00
Tannias—	$1·20	—
Yams—White	$1·68	—
Buck	$1·44	—
Sugar—Dark crystals	$2·30	$2·30
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Molasses	—	—
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A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XII. No. 287. BARBADOS, APRIL 26, 1913. PRICE 1*d*.

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Recent Work on Heredity.

DURING the past ten years our conception of heredity has undergone a transformation. It was formerly the current idea that specific differences in organisms arose gradually through the cumulative action of natural selection, yet about the way in which these gradations were carried from generation to generation, nothing was known. Of late years, however, investigation has turned upon this subject of transmission of characters, and having first resulted in the rediscovery of Mendel's Law, it eventually gave rise to the current theory of mutations and the luminous conception of Discontinuity. It is now believed that specific characters exist as indivisible units, somewhat analogous to the chemical atoms. These units are present in the male and female generative germ cells, and heredity consists in their transmission from generation to generation, and mutation is probably a redistribution in their arrangement through hybridization. Such is a brief outline of the basis on which the work of the modern breeder is conducted.

Besides providing much that is of interest to the West Indies, a good idea of modern lines of investigation in genetics is to be seen in the papers read at the Fourth International Conference on Genetics held in Paris during 1911, the full report of which has recently been issued. In the first place, during this conference, there were two papers read by W. Lawrence Balls and by W. A. Orton, respectively, dealing almost entirely with the breeding of cotton. It is a significant fact that the results obtained were for the most part of a complicated nature, but the view was more than once expressed that although the cotton plant is subject to variation—perhaps more so than any other cultivated plant—yet the variation is in no way abnormal, being due to segregations, reversions and recombinations of a large number of factors. In Egypt, pure new types have been bred by crossing Egyptian and American species, and in the same country the transmission of a meristic character has been investigated, namely the inheritance of variations in the number of loculi in the bolls. A segregation was found to occur in the third generation. This matter is of particular interest since the question of variation in the number of loculi has already attracted attention, in a practical way, in the West Indies. Another aspect in the breeding of cotton was dealt with in a paper by W. A. Orton describing American work on the raising of disease-resistant strains of cultivated plants. In this it was show that disease-resistance in Sea Island cotton is a hereditary factor but of a physiological and not of an anatomical nature. In other words the faculty for resistance does not seem to be correlated with any particular form of structure.

In two other papers, several factors in the selection of maize were considered. The American work on the crossing of Chinese maize having a waxy endosperm with American varieties having a horny endosperm was cited in a paper by G. N. Collins and J. Kempton, and it was shown that the horny endosperm was dominant in the first generation. A seemingly new idea in regard to maize was the investigation of the relation between the position of the seed on the spike and the fold of the first leaf. Such a relation was shown to exist by R. H. Compton in a paper entitled Right and Left-handedness in Maize. Generally speaking, odd rows of seeds in the cob give an excess of seedlings in which the right-hand margin of the leaf curves over the left, the observer standing with his back to the mid-rib.

Of other tropical plants dealt with in the papers at this conference, reference must be made to the account by W. T. Swingle of the crossing of two species of citrus. The curious hybrids of the first generation were what are now well known as the cold resistant citranges of Florida. It was suggested that this remarkable mutation was due to alteration in the position of the chromosomes, bodies in the germ cells which are believed to be the carriers of Mendelian factors.

Among the matters having a more general bearing upon plant breeding may be mentioned the opinion expressed in a lengthy paper by E. Griffon, on grafting and sexual hybridization. It was concluded that specific differences cannot arise from buds on the stock and scion, though they may arise from the asexual union of cells on the cushion of the graft, a phenomenon closely allied to parthenogenesis. The importance of this latter form of reproduction was strongly emphasized in several other papers. As is well known, parthenogenesis is common in the Hawkweeds (*Hieracium*), in the cucumber and other plants, and consists in the development of the ovule without fertilization by the pollen grain. It will be obvious that in plants provided with this form of reproduction there can be no Mendelian segregation and the progeny of parthenogenetic hybrids will therefore always breed true.

Considerations on the fertility of flowers suggests an important reference in a paper by Major Hurst describing the work of the Burbage Experiment Station in England. In this communication attention was called to self-sterility—a phenomenon to which Bateson and other biologists attach much importance. It was found that there existed a high degree of self-sterility in the flowers of cabbages, that is, cross-fertilization is necessary for the production of fertile seed. Now selection on Mendelian lines depends upon self-fertilization or in-breeding, hence the occurrence of self-fertility is a barrier to selection along these lines. Since reference has just been made to the paper in which this point is brought out, it will be convenient here to outline in a general way, the nature of the genetic investigations conducted at the Burbage Experiment Station. Successful attempts are being made to ascertain the genetic constitution of various agricultural and horticultural plants with a view to obtaining improved varieties by hybridization. The work, however, is not confined to plants. The characters of the various breeds of poultry, live-stock and horses are being examined and the pedigrees of local families are also registered in order to determine what human characteristics segregate as dominant and recessive factors.

So far in the publication under consideration those matters have been abstracted which are likely to be of direct interest in the West Indies, but it must be pointed out that no reference has been made to a large number of papers dealing with more abstract lines of investigation. Although of great biological interest, these possess at present but little economic significance. Nevertheless they are helping to elucidate new problems that have arisen out of investigations in the past, and they are leading to the conception of new ideas which may in time prove to be of the greatest practical importance.

VALUE OF THE UPPER AND LOWER HALVES OF THE SUGAR-CANE.

An article by Irving H. Morse in the *Louisiana Planter* for January 4, 1913, calls attention to the advantages of working mature and immature parts of the sugar-cane separately. That an innovation of this kind might be advantageous to sugar manufacturers in Louisiana where the purity is comparatively low when considered with that of West Indian juice, is a matter of some possibility, but in these islands, under normal conditions, the idea would not appear to be practicable. However, the subject possesses several points of interest which may receive consideration here.

In summing up the advantages of his idea of working the mature and immature parts of the cane separately, Morse makes the following statements: (1) that there would be a larger income from a ton of cane; (2) that the expense of manufacture would be less; (3) grinding could begin two weeks earlier (4) cane-cutting machines could be used; and (5) that by manufacturing syrup from the same kind of cane a standard grade could be produced which would find a market in all parts of the United States.

The reason for the first statement is apparently the fact that, in Louisiana, one-third of the cane is worked at a loss owing to the low sucrose and purity ratios of the upper part of the cane. It is held that the tops would yield a greater financial return if made into syrup than they would if ground together with the lower part of the cane in the ordinary way. Figures are given in support of this contention.

In the factory, however, it would be necessary to make considerable changes in order to manufacture both sugar and molasses at the same time; and it is advocated that the mill might either grind three watches a day on bottoms and one on tops, or three days on the former and one on the latter, depending on the amount of each.

An important advantage is the indication that the adoption of the system would make the commencement of grinding earlier, but it is not altogether certain whether the separation of tops and bottoms in the field could be as easily dealt with by machinery as the author maintains it could. If it had to be done by hand, the Cuban custom would have to be followed, where the men cut the canes in pieces in the field, and throw them into heaps. In the case of the new system which is advocated, the cutters would have to throw the tops and bottoms in different piles; and it may be added incidentally, that if the method ever became established, it would be extremely advantageous as a means of eliminating diseased canes which often cannot be detected before they are cut.

Although, as already stated, the subject is chiefly of academic interest and of little practical importance in the West Indies, still the question of topping 'short' or 'long' is a practical matter which has occasioned some local controversy. In St. Kitts the question has already received some experimental investigation, and the foregoing information may be found of use in its relation to this more limited aspect of the relative value of the upper and lower halves of the sugar-cane.

Effect of the Plough Hitch on Draft.—The following results of a graphical and mathematical analysis of draft in relation to the hitching of engine ploughs, will be of particular interest in places where steam or motor cultivation is employed. The extract is taken from the *Experiment Station Record*, Vol. XXVII, No. 7:—

'Conclusions are drawn that the best results are obtained by making the hitch a little to the right of the centre of the plough, and by hitching as high on the engine as possible without carrying the front end of the plough off the ground, and that the larger the plough the more economical it is in power. From the graphical analysis the formula is deduced for the desired hitch for any sized plough of $D = \frac{AC}{2C+B}$ in which D = the distance in inches from the first plough centre to the hitch, A = distance from the centre of the first plough to the centre of the last plough measured at right angles to the furrow, B = the distance from the centre of the first plough to the centre of the last plough, measured parallel to the furrow, and C = the distance in inches from the front plough bottom to the engine draw bar. For practical conditions 12 inches should be added to D.'

AMERICAN VIEWS ON A TROPICAL UNIVERSITY.

Quite recently a very deliberate and impartial treatment of the subject of an agricultural university for the British Tropical Possessions has comprised an editorial in the New York *India Rubber World* This article calls attention to the recent advocacy in *The Times* (see *Agricultural News*, Vol. XII, pp. 49, 59, 87 and 97) for the immediate establishment of the institution in the West Indies and, in continuation states: '*The Times* does not designate any particular island, but to anyone who has travelled extensively through the West Indies, Trinidad will immediately suggest itself as an ideal location for such an institution.'

A considerable part of the editorial is naturally devoted to reflections on the benefits that would accrue from a materialization of the scheme in regard to America and the rubber industry, but evidence of a broad-minded appreciation of the wide scope of the proposed University is clearly indicated in the following passage referring to the question of location in Trinidad: 'It is readily accessible, not only to the English, but to Canadians and to the United States, and it (the University) would naturally draw its student supply, not only from the mother country, but from the surrounding islands, from South America, and from North America. . . . . and train them so broadly that after leaving its doors they would be at home in any tropical country—whether the West Indies, South America, Africa or the Far East.'

These and other statements make it evident that the central idea or spirit of the movement has been fully comprehended by the writer, namely that one self contained institution and not an extension of existing educational units is the crying need in tropical agriculture—an institution that is big enough to undertake abstract research, to train experts and practical agriculturists, to exercise an economic and moral influence over tropical affairs, and at the same time central enough to administer, and to collate the scientific results of isolated investigators.

The Campaign Against Tuberculosis.—The following extract dealing with bovine tuberculosis is taken from *The Times Weekly Edition* (March 14, 1913) where an account is given of the proposals contained in the final report of the Departmental Committee on tuberculosis, appointed in February 1912:—

'The Committee are of opinion that the bacillus of bovine tuberculosis is a cause of tuberculosis in man, and to a greater extent in children, and that the best way to attain complete security from the danger of bovine infection is entirely to eradicate tuberculosis from the cattle of this country. They think that this is not impossible of achievement, but is likely to be a slow process, and must depend upon co-ordinated and continuous effort. No single or purely local effort will suffice to eliminate such tuberculosis. The Committee welcome the proposed legislation dealing with the question of milk supply, which they consider should be upon the widest possible basis and should include the whole country. They are of opinion that county and county borough councils should have power to inspect herds, dairies, and farm buildings, to administer all enactments relating thereto, and to require that certain cows should be slaughtered, in the interest both of the public and of the dairy industry.'

FRUITS AND FRUIT TREES.

THE ST. MICHAEL'S ORANGE.

An interesting letter in the handwriting of the late Sir J. D. Hooker, O.M., written in 1896 to Dr. (now Sir Daniel) Morris, has recently been discovered in one of the files at this office. The communication concerns the old St Michael's orange, and the description by the famous botanist of this old well-known variety is extracted as follows from the letter referred to:—

> As I must be one of the very few living persons who know what the St. Michael's Orange was like, it may be expedient that I should record my recollections of it.
>
> In my youth this orange was annually imported into Glasgow in great quantities, being brought by clipper ships, the earliest of which to arrive was reported to have claimed a special award.
>
> It was a small orange, about one-third short in bulk of the beautiful Canaries fruit, of rather oblate form, high colour, great fragrance and with usually a dark ring around, but a little distant from, the scar of the style. The flesh was of a good yellow colour with few seeds and of a rich flavour. The pericarp was thin and rather loose. I have seen nothing like it in the market since 1839, when I left home
>
> It might be worth while to enquire, through our Consul at the Azores, whether such an orange exists there now, and if so, to ask for a box. Also to ask Rivers what he knows of the St. Michael's Orange. When next I go to Kew I will look up Risso and see if I can match any figures by him with my recollections of it.
>
> At the Cape de Verde (Porto Preye) I found magnificent oranges, quite half as large again as the Canaries, of globular form, with an enormously thick, soft, highly coloured, and very loosely attached pericarp; the flesh was delicious. I have seen none like it since.

THE INTRODUCTION OF EXOTICS.

It has been decided by the Government of India to publish a series of memoirs describing the introduction into, and the cultivation of, useful exotic trees in that country, particularly in those habitats where it is difficult to obtain a valuable growth of indigenous species. The first exotic to be dealt with is *Prosopis juliflora*, D.C. (the cashaw of Jamaica—familiar in Mexico under the name of Mesquit bean), the characters and behaviour of which in India are described in the *Indian Forest Records*, Vol. IV, Part 3.

In this account of the cashaw (*Prosopis juliflora*), it is pointed out in the memoir that the plant is strongly xerophilous and well adapted to thrive in India on dry soils and in arid districts. The tree is stated to be useful as a sand binder, and also as a pioneer in afforesting dry grasslands and waste areas, where more valuable species cannot be got to grow. The pods constitute a useful fodder, and are much enjoyed by cattle, especially in dry years when grass is scarce. Apparently in India these pods do not tend to produce tympanitis in cattle as they do in Jamaica.

The wood of the cashaw is of considerable value, especially that of the variety *velutina*, which is said to attain a height of 50 feet and a diameter of 2 feet.

The account of this tree also contains a botanical description of the species, a discussion on taxonomy, and an historical review of the species since its introduction into the East from America.

The World's Production and Consumption of Rubber.—According to statistics published in Singapore, the total production of wild and plantation rubber throughout the world in the twelve months ended June 30, 1912, amounted to 93,669 tons, as compared with 79,302 tons in the previous year, and 76,026 tons in 1909-10. On the other hand, the total consumption of 1911-12, is returned at 99,564 tons, as compared with 74,082 tons in 1910-11, or an increase of 25,482 tons, whereas the quantity consumed in 1909-10 was only 4,037 tons in excess of the preceding year. The world's stocks of rubber on July 1, 1912, are reported to have been 10,181 tons, as against 12,563 tons on the same date in 1911. This is a reduction of 2,382 tons, and compares with an increase of 5,565 tons on July 1, 1911, as contrasted with the position on July 1, 1910. The considerable expansion in consumption in 1911-12 is attributed largely to the lower level of prices prevailing during the year. (From the *Journal of the Royal Society of Arts*, March 14, 1913.)

SUBSOIL WATER.

The series of dry seasons experienced recently in the majority of West Indian colonies naturally cause attention to be drawn to questions of agricultural water-supply. In the following article by Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands, the principles which govern agricultural water-supply are described. The fact that, even during times of drought, a large reservoir of water exists below the soil is not always recognized, nor are the laws which govern the movement of the supply towards the roots of vegetation growing above. These, among other points are dealt with in the following account of the subject of subsoil water.

All supplies of fresh water are in the first instance derived from the atmospheric condensation of rain (including snow) and dew, which are precipitated on the land surface and serve directly to minister to the needs of plant life. Of the supplies received in this way, a portion soaks into the land; the amount which is capable of being thus absorbed, will depend on the texture of the soil and the underlying subsoil. When this is coarse and open, the capacity of the soil for absorbing water is relatively great. On the other hand, in the case of close-textured soils, in which the finer particles of the clay order of magnitude predominate, the rate of absorption is naturally slower. In any case, when the rate of precipitation exceeds the absorptive capacity of any soil, the excess of water passes off along recognized channels in the form of surface drainage or storm water, and unless special facilities exist for conservation, becomes lost to the area on which it falls.

The water which is absorbed by the soil, however, tends to accumulate and form an underground reservoir. This accumulated supply may conveniently be termed subsoil water, and serves as a source from which water is drawn by capillarity from below through the layers of soil to supply the needs of growing plants, supplementary to the amount available from actual precipitation.

In an article in the Yearbook of the United States Department of Agriculture for 1911[*], the question of the subsoil water of the central regions of the United States is dealt with, and the considerations presented in the concluding part of the present article are partly derived therefrom.

In general, subsoil water permeates the soil, subsoil and underlying rocks. The quantity present usually increases from the surface downwards to a point varying in depth according to the prevailing conditions, and after that, diminishing as the pressure of the overlying rocks and soil increases. Under the conditions dealt with in the article in question, it is estimated that the amount of water contained in the first hundred feet from the surface is equal to one-quarter of the total volume of ordinary porous soil, subsoil, rock. In other words, this is an equivalent to a reservoir of water 25 feet in depth, or a supply equal to the total rainfall over average years under the conditions in question.

It will be seen that the aggregate quantity of water thus available is considerable, and it is useful to conceive it as an actual reservoir susceptible of increase and diminution, and differing from an open pond chiefly in unevenness of its upper level, this latter effect being due to obstruction of free movement by the earth within which it lodges.

Water contained in subterranean reservoirs in this way moves under gravity, tending to flow from a higher to a lower levels at rates which depend on the permeability of the material through which it passes. Moreover, it is subject to capillary movement, and thus unlike free water, the upper level of the subsoil water will tend to conform to irregularities of the ground level.

Under the influence of these two forces the upper level of the subsoil water is indefinite; the moisture content of soils increasing gradually downwards until a point is reached at which the surrounding subsoil or rock is saturated.

Wells derive their water-supply from subsoil water, as also do by far the greater part of normal brooks and rivers (apart from storm water), and the varying levels of these mark variations in the level of the subsoil water by which they are supplied.

The level of saturation is known as the water-table; it is convenient to distinguish between the level of the saturation which is effective in supplying capillarity, from that (generally somewhat lower) level at which water is delivered freely into wells. The former is termed the 'agricultural water-table', the latter the 'well-water table'.

The quantity of subsoil water permeating the earth varies to some extent with the texture and structure of the materials, and these factors also influence its movements to a very considerable degree. Through gravels and sands it flows with a freedom approaching that of open streams, whilst through clays and close-textured rocks it may move only at an imperceptible rate. When the underlying rocks consist of permeable limestone however, large cavities and fissures may in course of time become created, as the result of the solvent action of water containing dissolved carbon dioxide, and thus form those subterranean reservoirs and channels commonly termed underground rivers and lakes; which receive drainage of the surrounding rocks, and facilitate generally the movements of subsoil water.

The limit of vertical movement of soil water is, of course, the distance between the surface of the soil and the agricultural water-table, but when the latter is removed to considerable depths below the surface, the water available for plant growth in this way becomes increasingly restricted. It may be broadly stated that, under average conditions, capillarity acts freely to a depth of 4 or 5 feet; fairly, to a depth of 10 feet; and slowly, to 30 feet or more.

In certain cases, especially those of very heavy low-lying lands, the water-table may approach very near to, or even rise above, the soil surface. Under these conditions, lands become water-logged, and it is then necessary to lower the level of the water-table by drainage, to permit of the lands being utilized.

In districts liable to suffer from drought it is obviously a matter of importance agriculturally to know whether the reserve supply of subsoil water, available for eking out the rainfall, approaches the surface to within 10 feet, or comes within 30 feet, or lies so much deeper as to be beyond the reach of capillarity.

Moreover, a proper appreciation of the conditions governing supplies of subsoil water is of importance in relation to attempts to utilize them as industrial and domestic sources of water.

In the foregoing article the main principles relating to this question have been outlined. It is proposed subsequently to deal with certain aspects of the case having special reference to conditions obtaining in West Indian islands.

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[*] 'Subsoil Water of Central United States', by W. J. McGea, United States Department of Agriculture Yearbook, 1911, p. 479.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date April 7, with reference to the sales of West Indian Sea Island cotton:—

About 200 bales of West Indian Sea Island cotton have been sold since our last report, comprising about 80 bales Barbados 19*d.* to 19½*d.*, 110 St. Kitts chiefly 18*d.* to 20*d.*, with a few inferior bales 16½*d.* to 17*d.* and a few bales of Superior Montserrat at 18*d.*

The market is firm, but the demand is chiefly for fine-fibred cotton 19*d.* to 20*d.*, and in consequence the chief sales are Barbados and St. Kitts, the latter being preferred on account of its extra fineness. Lower qualities from the Leeward Islands and the finer sorts from St. Vincent are neglected at the moment, but we are of the opinion, judging from crop reports, that prices will remain firm throughout the season.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending March 29, is as follows:—

The market has been quiet throughout the week, with sales of 150 bales of off cotton, and in the absence of any further demand remains unchanged and we have only to confirm our previous advices and quotations.

We quote, viz:

Extra Fine	28c. to 29c.	= 16*d.* to 16½*d.*	c.i.f., & 5 per cent
Fully Fine	26c. to 27c.	= 14¾*d.* to 15¼*d.*	,, ,, ,, ,,
Fine	25c.	= 14¼*d.*	,, ,, ,, ,,
Extra Fine off in preparation	24c.	= 13½*d.*	,, ,, ,, ,,
Fully Fine off in preparation	18c. to 20c.	= 10½*d.* to 11½*d.*	,, ,, ,, ,,
Fine off in preparation	18c.	= 10½*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to March 29, 1913, were 421 bales, 1,073 bales, and 4,008 bales, respectively.

Information has been received to the effect that, at the 110th meeting of the British Cotton Growing Association held in Manchester on April 1, 1913, it was reported that the cotton yields in the Sudan this season are most satisfactory, as much as 660 lb. of lint per acre having been obtained in the Tayiba district. In West Africa the crop is late, but a record total output of 20,000 bales is estimated. In Nyasaland the crop continues to be held up through bad transport facilities, but the position will improve with the construction in the near future of a railway from Port Herald to Zambesi. The production of cotton in Uganda continues to increase, but at present the transport facilities on the Uganda railway are inadequate. It is thought that it will be necessary at an early date to double the line.

THE COMPLEXITY OF THE MICRO-ORGANIC POPULATION OF THE SOIL.

During 1910, the interest of agricultural scientists was deeply aroused by Russell's and Hutchinson's announcement of their results on the phagocytic protozoa in the soil, and the effect of partial sterilization upon fertility In this journal the subject was explained at considerable length (see *Agricultural News*, Vol. IX, p. 33), and further developments along the same line have been noted from time to time (Vols. X, p. 335; XI, pp. 131 and 151) In the last issue of this journal appeared an abstract of the work of Russell and Petherbridge on soil sickness and partial sterilization, and the present article should be an appropriate and arresting addition to those just referred to.

It concerns a letter by Russell, published in a recent number of *Science* (April 4, 1913), refuting the adverse criticisms of American workers on the phagocytic theory which this author has established on the basis of the Rothamsted researches.

In order to indicate the stability of his contentions, Russell first proceeds to enumerate the experimental facts upon which he bases his arguments. Briefly they are as follows:—

(1) Partial sterilization of the soil brings about an increased bacterial content.

(2) Simultaneously there is an increase in the production of ammonia formed from organic nitrogen compounds.

(3) Partial sterilization improves the soil as a medium for bacterial development.

(4) The improvement is permanent.

It is evident from (3) and (4) that the factor limiting bacterial numbers in ordinary soils is not bacterial, nor is it any product of bacterial activity, nor does it arise spontaneously in soils.

(5) The limiting factor can be re-introduced by inoculation.

(6) The effect of increased temperature on untreated soils makes it evident that the limiting factor in untreated soils is not the *lack* of anything but the *presence of something active.*

(7) If the partial sterilization is sufficient to kill nitrifying bacteria (which are susceptible organisms) the limiting factor is also extinguished; if the nitrifying bacteria are only temporarily suppressed the factor is also only put out for a time.

(8) The properties of the limiting factor are: (a) It is active and not a lack of something; (b) it is not bacterial; (c) it is extinguished by heat or poisons and does not reappear if the treatment has sufficed to kill sensitive and non-sporing organisms; it may re-appear, however, if the treatment has not been sufficient to do this; (d) it can be re-introduced into soils from which it has been permanently extinguished by the addition of a little untreated soil; (e) it develops more slowly than bacteria and for some time may show little or no effect, then it causes a marked reduction in the numbers of bacteria, and its final effect is out of all proportion to the amount introduced; (f) it is favoured by conditions favourable to trophic life in the soil.

(9) It is impossible to escape the conclusion that the limiting factor is a living organism.

(10) Protozoa naturally suggested themselves. Large numbers of ciliates, amœbæ and flagellates were found in the soil, and whenever they were killed the detrimental factor was found to be put out of action. Whenever the detrimental factor was not put out of action the protozoa were

not found to be killed. Sometimes ciliates and amœbæ were found in soils in which the detrimental factor had been put out of action but methods did not enable the investigators to discriminate directly between protozoan cysts and active forms. In general, however, the parallelism between the detrimental factor and the soil protozoa was so complete as to justify the conclusion that protozoa were the detrimental organisms.

A vain search was made for bacterio-toxins, for evidence of bacterial stimulus, of improvements in the bacterial flora. The inability to isolate toxins did not necessarily disagree with Schreiner's work in America since this investigator experimented with badly drained and aerated soils, whereas those used at Rothamsted were well drained, well aerated and well supplied with calcium carbonate.

Turning now to the criticisms that have been passed on the above results in America it will be convenient to present the following summary:—

Lipman and others state that when pasteurized and untreated soil infusions are added respectively to mixtures of dried blood and sterilized soil (heated under a pressure of 1·5 atmospheres of steam) the pasteurized infusions induce after seven days the formation of no more ammonia than the untreated infusion. These results, they say, do not bear out Russell's and Hutchinson's contention as to the part played by protozoa in depressing the activities of soil bacteria.

In return, Russell asserts that the argument does not bear upon the question, for the following reasons:—

(1) The failure of the protozoa to develop in the highly heated soil would be no evidence at all of their inability to develop in normal soil.

(2) As a matter of fact, in this highly heated soil the nitrifying bacteria did not appear to develop: 'Would Dr. Lipman argue,' writes Russell, 'that this result does not bear out the usual contention as to the part played by nitrifying organisms in the soil?'

(3) Even if the detrimental organisms could develop in highly heated soil they were not given a chance: Russell and Hutchinson never observed any development in anything like so short a period as seven days: their experiments had always been continued much longer.

(4) Lastly the action of the detrimental organism is to keep down the *numbers* of bacteria. Now the rate of ammonia production is not necessarily a measure of bacterial numbers and therefore affords no rigid test of the activity of the detrimental organism.

The next critic is Stone, who states, on the evidence of Lodge's and Smith's experiments, that he considers protozoa have little or no part in accounting for the increased number of bacteria in their soils. The experiments consisted in the addition of soil bacteria to decoctions of untreated soil and of soil heated for forty-five minutes to 200°F. Greater bacterial development occurred in the decoction of sterilized soil than in the decoction of the untreated soil. (A subsoil behaved differently.) The authors stated that protozoa were absent and that the results must be due to other causes.

Russell answers as follows:—

(1) He agrees entirely with the last conclusion, but points out that it throws no light on what happens in untreated soil. It therefore does not bear upon the question under immediate discussion.

(2) As regards the absence or paucity of protozoa in the Massachusetts soil, Russell hints that it would be interesting if the investigators had explained the difference between their soil conditions and those at Michigan where Rahn found protozoa of the same types occurring in numbers of the same order per gram as were found at Rothamsted in England.

Space will not permit reference to further criticisms of a similar nature. In conclusion Russell fully acknowledges that the phagocytic protozoa constitute only one factor which may limit soil fertility, but he maintains, and proves satisfactorily, that it is an extremely important one. It would appear that the controversy has arisen through confusion on the part of some American investigators in their enthusiastic endeavour to study more than one factor at a time, and through insufficient consideration being given by agricultural chemists in that country, to the fact that a highly heated soil provides an entirely different medium for micro-organic development than does partially sterilized and untreated soil.

ST. KITTS AGRICULTURAL AND INDUSTRIAL SHOW, 1913.

In the last issue but one of the *Agricultural News* it was stated that the seventh Agricultural and Industrial Show had been held in St. Kitts on March 7, 1913. As was promised, further details are now given in regard to the nature of the exhibits and the awarding of the prizes.

The show of 1913 both in number and quality of exhibits, was a distinct advance on those of the last two years. The total number of exhibits this year was 811 as against 620 in 1912 and 736 in 1911. The 811 exhibits were made up as follows: live stock, horses, mules and cattle, 68; sheep, goats and pigs 14; poultry and rabbits 30; sugar-cane and its products 59; fruits 73; vegetables 165; industries 49; fancy work 47; preserves 124; maize and starches 46; plants and flowers 47; school exhibits 5; miscellaneous 69.

In the horse class, and in the driving and riding competitions several interesting exhibits were shown, but in the cattle class the representation was distinctly poor as compared with previous years. The first prize for mules was awarded to Mansion estate for a very fine team imported from Montserrat.

The sugar-canes were numerous and of high quality, especially in the class for cut canes. The first prize for cut canes weighing 140 lb., and for four varieties of cut canes, six of each variety, weighing 235 lb., were won by Molineux estate. A diploma of merit was awarded Brighton estate for vacuum pan sugar.

As formerly stated, the exhibits of fruit and vegetables were a distinct advance on those of previous years. Prizes were won by Mr. J. Mulrain and Mr. J. Fraites.

The exhibits comprising the industrial classes represented fancy work, tailors' work, native wood work, and a fine exhibit by Mr. McConnel, Chairman of the Fine Cotton Spinners' Association, showing cotton in all stages of manufacture from raw cotton to yarn. Another very striking illustrative exhibit was a collection of scientific and economic specimens from the laboratory of the Leeward Islands Department of Agriculture, and in the miscellaneous class very creditable exhibits of cotton seed cake meal, oil and native cigars were to be seen.

The prizes won at the show and the diplomas of merit awarded by the Imperial Department of Agriculture were distributed by His Honour the Administrator, at a special meeting of the Agricultural and Commercial Society held on Tuesday April 1, 1913.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

The leading article in this number deals in a general way with some of the more recent lines of investigation on Heredity in relation to Agriculture.

On page 131 will be found a note describing views in America on the establishment of a Tropical University.

The practical significance of subsoil water in relation to the cultivation of crops is discussed in an article on page 133. Certain points in this article are referred to under Students' Corner.

On page 134 a description is given of the recent Anglo-American controversy in connexion with the phagocytic theory of soil protozoa.

Under the caption Insect Notes, on page 138, the subject of root borers and other grubs in West Indian soils is continued from the last number of this journal.

A comprehensive account of the proceedings of the recent Tuberculosis Conference in Trinidad is presented on page 139.

The Fungus Notes in this issue comprise Part II of the description of work in the West Indies on the parasitology of the red rot fungus of the sugar-cane.

Effects of Manurial Salts on Germination.

Some interesting series of experiments have been carried out by Rusche with temperate species of cultivated plants, to test the effect of such salts as the nitrates and chlorides of sodium and potassium upon the rate of germination. The results obtained are abstracted in the *Journal of the Chemical Society* for February 1913, and since the effects observed are likely to have their parallel in regard to tropical species, the following facts are noted as being interesting and suggestive.

Potassium chloride was found to act not unfavourably on the germination of cereals, peas, rape and beet, but unfavourably in the case of clovers and other leguminous fodder plants. Sodium chloride was found to be more unfavourable than the potassium salt except with barley, lupins, serradella and rape. Nitrates are generally more favourable than chlorides; ammonium nitrate, however, resembled the chloride in being distinctly injurious, especially to clovers. Of all the salts employed, sodium and potassium carbonates were found to be the most favourable As regards the length of roots, nitrates produced the shortest roots with cereals. The longest roots were obtained with sulphates and phosphates. In the case of peas, the longest roots were obtained when no manure was used.

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Explosives in Agriculture.

Since the beginning of the current year an unusually large number of agricultural journals have called attention to the importance of explosives in the cultivation of land. An interesting and extremely well-illustrated article in the *Agricultural Gazette of New South Wales* (January 1913) emphasizes the value of dynamite in the clearing of bush land. An account is given of the different kinds of explosives and the methods of firing, the latter being either by means of the safety fuse or by electricity. It is indicated that the advantages accruing from the felling of trees by dynamite lie, not only in the fact that the stump is removed, and but also in the fact that the small limbs are broken off by the concussion and fall. The *Cuba Magazine* for March 1913 calls attention to the value of explosives in the breaking up of hardpan in citrus cultivations in Florida, where four-ounce charges of 30 per cent. dynamite have been exploded under trees in bearing with eminently satisfactory results. From the purely physiological aspect of soil aeration, the *Planter's Chronicle* (February 8, 1913) strongly advises a careful employment of this form of subsoil cultivation: and lastly reference must be made to the advocacy of *Tropical Life*, and to that of the *India Rubber World* (April 1, 1913) which devotes an editorial to the subject, indicating the value of dynamite for preparing holes for the actual planting of rubber trees, and its utility as a destroyer of animal and vegetable parasites. In the West Indies, perhaps the greatest use of dynamite would lie in the removal of large boulders of volcanic rocks which at present on many estates so seriously interfere with the thorough cultivation of the soil.

The French Antilles and the Panama Canal.

In an article entitled Le Canal de Panama et nos Colonies, which appears in *L'expansion Coloniale* for March 1913, reference is made to certain projects for improving the harbours of Martinique and Guadeloupe, in view of the increase in the shipping trade between Europe and Central America, that will take place in 1915 on the completion of the Panama Canal.

. It is asserted from the evidence obtained in 1912 by the French Commission sent by the Government to investigate that country's colonial ports of call, that there is no occasion for the creation of a coaling station or provision port because of the proximity of the islands to Panama, and because of the fact that the ports in question do not lie on the direct route. Nevertheless the Commission was of opinion that it would be desirable to improve the harbours in response to the needs of the Colonies themselves and their regular development. A project to deepen the anchorage at Pointe-à-Pitre to allow steamers to go alongside the wharf, is estimated to cost three and half million francs.

Wild Silk Cocoons from Mozambique.

The *Jornal d'Agricultura da Companhia de Moçambique*, Vol. II, No. 2, contains a report on a sample of cocoons, the product of a species of Anaphe, sent for examination to the Imperial Institute. The sample was collected in the forests of Madanda and Mafuci and appeared to be similar to the Anaphe silk obtained in Southern Nigeria.

In the examination, six of the nests were cut up and sorted into three grades; (1) the outer layers consisting of the paper-like covering and the loose-textured silk beneath it; (2) the parchment-like layer and (3) the cocoons. Fair samples of each grade were taken for examination and were submitted to the 'boiling off' process with (a) 3 per cent. sodium carbonate solution and (b) 3 per cent. soap solution. The results obtained were as follows: (1) loss in outer layers after treatment in (a) and (b) for one hour, 25 per cent. (expressed on the dry silk): (2) loss in parchment-like layer after two hours treatment, 18·5 per cent.: (3) loss in cocoons after ¾-hour treatment, 29·4 per cent. These losses on boiling off were rather high compared with those obtained with samples of Anaphe silk from Southern Nigeria and Uganda.

It is stated further that the cocoons are too loose in texture to allow the silk to be wound off or reeled, as is done in the case of the mulberry silks. It is possible, however, by carding and combing to convert the whole of the silk, both from the external layers and the cocoons, into 'spun' silk, which could be used for manufacturing purposes if obtainable in large quantities and at a sufficiently low price. Crude nests of Anaphe from Uganda, of somewhat superior quality, have been stated to be worth 4½*d.* per lb. in the United Kingdom.

The Periodicity of Tropical Plants.

The above subject has recently received attention by Klebs, whose investigations have been made to ascertain (1) whether the growth of tropical plants is on the whole periodic and (2) whether the periodicity so far as observed in the Tropics is a constant character or is capable of being modified by varying the conditions. The work is described in the *Experiment Station Record* for January 1913 from which the present note has been abstracted. Leaf fall was the chief character investigated, and in a number of tropical species it was found to occur non-periodically, but some plants become periodic in this respect after they are old. Other plants were found to cast their leaves, apparently in response to changes in environment, at a time when normally they would not do so; still other species, according to variations of nourishment, cast their leaves all at once or only gradually through a long period.

In Java and Ceylon similar observations by Volkens led to the conclusion that no general connexion can be regarded as established there between leaf fall and climate.

Effect of Drainage on Rice Soils.

Interesting results are recorded in the *Agricultural Journal of India* for January 1913, the outcome of a series of pot cultures of rice plants of the same age and variety made with the object of ascertaining some of the soil conditions under which a disease of rice called Ufra, is likely to occur. In the different series, half the pots had the tubulure at the base plugged to prevent drainage; in the remaining half this was left open. The most interesting results were obtained by the addition to the pots of oil cake (at the rate of 60 lb. N per acre). After thirty-two days' growth, all the plants (drained and undrained) so manured had turned brown and appeared withered and moribund. The effect appeared to be due to a direct toxic action of the products of decomposition of the cake; laboratory experiments at the same time showed that no nitrification was going on in the saturated undrained soil, but that certain anaerobes were producing foul-smelling decomposition products such as indol, and gases including nitrogen, marsh gas and carbon dioxide. In the drained soil the toxic products were quickly carried away which resulted in the rapid recovery and eventual good growth of the plants. Those in the undrained soils never properly recovered. The addition of oil-cake was found to produce greatly increased tillering.

In the undrained pots, the root development below soil level left the original long stem of the transplanted seedling with a bunch of roots at its lower extremity; in the drained pots, however, the lower part of the stem rotted away, leaving only the upper half with a much more fully developed bunch of roots. In other words, the deeper root system was found to occur in the undrained soil which is contrary to what would be expected. This curious phenomenon is explained by the fact that, in all probability, the plants in the undrained soils were almost entirely dependent upon anaerobic food, which, of course, would be most abundant at the bottom of the pot.

INSECT NOTES

ROOT BORERS AND OTHER GRUBS IN WEST INDIAN SOILS.

In the last issue of the *Agricultural News* it was stated that the continuation of the above notes in the present number would concern the family of beetles commonly known as hard backs. The subject is now continued as follows:—

SCARABAEIDAE.

The insects which are grouped together in this large family are numerous and widely distributed. They are divided, according to the habit of feeding, into two groups: the leaf chafers, Melolonthidae; and the scavengers, Dynastidae. At the present time only the leaf chafers would be taken into consideration but for the fact that certain of the scavengers have at times functioned as pests of more or less severity. This raises the question as to how far the feeding habits of so-called scavenger beetles are constant, and whether these insects may not all be able to subsist on living plant tissue when by reason of their unusual numbers, or a lack of the preferred food, they are driven to it.

MELOLONTHIDAE.

The brown hard back in Barbados (*Phytalus smithi*). References: *Agricultural News*, IX, p. 186, (*Cyclocephala*); Report on *Phytalus smithi*, Arrow, in Mauritius, by D. d'Emmerez de Charmoy, Mauritius, 1912; Annual Reports of the Local Department of Agriculture, Barbados.

This insect is known to occur in Barbados and Mauritius.

Of all the insects under consideration in the present series of articles none has gained such world wide notoriety as *Phytalus smithi*. The enormous increase of this insect within four years from the time it was first known to exist in Mauritius, to such an extent that it seemed to threaten the extinction of the sugar industry of that island, amply illustrates the danger attending the transportation of an insect of this kind from its native environment into a locality where its natural enemies do not exist. No other insect of this series has formed the subject of such complete scientific investigation as *Phytalus smithi*, the results of which are recorded in the report by de Charmoy, referred to above.

Phytalus smithi exists in Barbados, being found in the soil of cane fields, gardens, and of plant tubs. The adult insect is slightly longer and narrower than the ordinary hard back, and the legs are more slender.

In 1906 specimens of the adult beetle were forwarded to the Imperial Department of Agriculture with the information that they had been found among the leaves of sugar-cane plants on which they had apparently been feeding.

In May 1910, the beetle occurred in considerable numbers in two localities near Bridgetown, Barbados, where from 500 to 600 were captured during one night on roses and other garden plants. (See *Agricultural News*, Vol. IX, p. 186, where this insect is referred to as *Cyclocephala* sp.) At this time the larvae of the beetle were not known, being confused with those of the common hard back (*Ligyrus tumulosus*), which will be described later.

In Watson's paper on the root borer of the sugar-cane (see reference under root borer above), and in one by H. A. Ballou, entitled Review of Insect Pests Infesting the Sugar-cane (*West Indian Bulletin*, Vol. VI, p. 37), grubs of the hard back (*L. tumulosus*) are mentioned, in both of which the reference probably failed to distinguish between that species and *Phytalus smithi*.

At the present time the brown hard back is known to occur in some numbers in the same sugar-cane fields where *Diaprepes abbreviatus* (loc. cit.) is a serious pest. Phytalus, however, is not considered to cause any appreciable injury in these fields. This condition is due largely, perhaps entirely, to the fact that the grubs of Phytalus are extensively parasitized, and by that means effectually held in check. The parasitic insect is a small black wasp, *Tiphia parallela*, Smith, of the hymenopterous family Scoliidae.

It is probable that very little would be known of this brown hard back and its parasite in Barbados even at the present time, but for the fact that the grubs of this insect occur in the same fields with the root borer. The root borer has been the subject of regular investigation extending over a considerable period, and during this study observations on Phytalus have been made incidentally.

The extreme abundance of Phytalus in Mauritius may be indicated by merely stating the numbers of the beetles that were captured by hand collection and destroyed. The total catch for the season, August 1911 to April 1912 inclusive, was over 26 millions, whilst the largest catch for any one day (or night) was nearly 3 millions. The weight of these 26 millions of beetles is stated to have been about 20 long tons.

The method adopted for control, which gives promise of greatest efficiency, is that of collecting by hand. The canes in the case of badly infested fields are removed and the ground is cleared of trash. At the time when the adults are emerging, small leafy branches of trees are stuck into the soil, and on these the newly emerged beetles congregate. The collections are made at night by labourers, who carry small lights and collect the insects in suitable vessels.

Phytalus smithi is a root trimmer rather than a root borer. The larvae feed on small roots and are often to be found in greatest numbers in the middle of the banks, rather than in the cane holes.

At the present time *Phytalus smithi* appears to be known only in Barbados and Mauritius. Growing sugar-cane plants in soil have been imported into Mauritius from Barbados, and it may be that this insect pest was introduced in the soil with the canes. Since there is sufficient likelihood of this happening, canes ought not to be transported in this manner from one country to another.

The small brown hard back in St Kitts (*Lachnosterna patruelis*). Reference: *Agricultural News*, XI, p. 298.

This insect is known to occur in St. Kitts and Dominica. It was found in St. Kitts by the Entomologist on the Staff of the Imperial Department of Agriculture during a visit to that island, in 1912. Although it occurred in great numbers in the soil of the cane fields in one locality, and in smaller numbers in others, and perhaps to a limited extent in all the cane-growing sections of the island, none of the planters seemed to recognize it when specimens were shown to them, or even to know of its previous existence. As an explanation of this condition it may be stated that probably the adults are not at all attracted to light, and that the larvae when seen in the soil are mistaken for small larvae of the ordinary hard back, *Ligyrus tumulosus*, as was the case for many years in Barbados with *Phytalus smithi* and its larva. The adult of *Lachnosterna patruelis* has, so far, only been found in the soil in cane fields and other cultivated lands, and if observed in such situations might also be considered by planters as very small, immature specimens of the common hard back.

The larvae of *L. patruelis* are probably root trimmers in their feeding, i.e. they feed on small fibrous roots of sugar-cane and other plants growing in the soil inhabited by them.

The adults probably emerge from the ground at night and feed on the leaves of these or other plants. This would be likely to take place during the mating season, the nocturnal visits to the leaves of plants providing opportunity for feeding and the union of the sexes, as is the case with Phytalus and other insects of this group. The adult beetle is brown in colour, and in size is considerably smaller than the ordinary hard back.

The amount of injury caused by this insect to sugar-canes in St. Kitts is not known. No definite observations on this point have been made.

One or more parasites of *L. patruelis* exist in St. Kitts. During the visit mentioned above, the Entomologist found one larva of this species to which was attached the grub of a hymenopterous insect, probably one of the Scoliidae, but this was not successfully brought to maturity. In the sugar cane fields where the observations on *L patruelis* were chiefly made, there were observed two or perhaps three species of this group of wasps, one or more of which may be parasites of these beetle grubs. One of these Scoliid wasps (*Tiphia parellela*) has been mentioned above as a parasite of *Phytalus smithi*, in Barbados, and another, *Elis atrata*, a parasite of *Praepodes vittatus*, in Jamaica.

In the next issue of the *Agricultural News* the continuation of the present article will concern the different species of hard backs in Antigua, Porto Rico and St. Vincent together with the different species of beetles belonging to the group Dynastides, which includes the common hard back (*Ligyrus tumulosus*) and many other scavengers which may possibly, under certain conditions, become parasitic.

THE TUBERCULOSIS CONFERENCE IN TRINIDAD.

This Conference was the outcome of a laudable idea on the part of the medical staff connected with the Trinidad Association for the Prevention and Treatment of Tuberculosis, to ascertain and collate those facts having a bearing on the disease as it exists in the various British and Foreign Colonies and countries comprising the West Indies, and the adjacent mainland.

The Hon. Dr. H. L Clare, B.A., M.D., Surgeon-General of Trinidad, and Dr. G. H. Masson, M.D., the Hon. Secretary of the Association were mainly responsible for its inception, and much credit is due to them for their unsparing efforts in this direction.

His Excellency Sir George Le Hunte, G C M.G., Governor of Trinidad, interested himself in the movement, and with the sanction of the Secretary of State, conferred upon the proceedings the dignity of official business. The various Governments were approached and delegates were invited to attend in Trinidad from March 25 to 31, 1913; representatives were sent from Colombia, Martinique, Porto Rico, Surinam, from England and from the following British Colonies: Barbados, British Guiana, Jamaica, Leeward Islands, Trinidad, Windward Islands, and from the Imperial Department of Agriculture.

The inaugural meeting of the Conference was held on Tuesday March 25, in the Council Chamber, Port of-Spain, when the Delegates were presented to His Excellency and to Lady Le Hunte. The ordinary meetings were held in the Victoria Institute daily, under the presidency of Hon. Dr. H. L. Clare, M.D.; the final meeting, at which resolutions were passed, took place in the Council Chamber.

The deliberations were, on the whole, productive of much that was useful, the delegates agreeing in the main on most of the points raised, noticeable among which were the facts that tuberculosis is more rapid in its destructive progress in the West Indies than in temperate climates, and that surgical tuberculosis, in fact, any form other than pulmonary tuberculosis—popularly known as consumption—is comparatively rare.

The passing of resolutions was the last stage of the proceedings In all, five were submitted for the consideration of the delegates and were unanimously agreed to: they will therefore go out with the strong support of the Conference.

Dr. Cecil Wall (Great Britain) proposed, and Major Dr. Noc (Martinique) seconded a resolution pointing to the desirability of the administrative control of tuberculosis including (1) notification, (2) housing reform, (3) the establishment of tuberculosis dispensaries and other machinery for the detection, prevention and treatment of the disease Hon. Dr. Godfrey (British Guiana) moved, and Hon. Dr. J. Hutson (Barbados) seconded 'That tuberculosis associations be started in West Indian Colonies where they do not now exist.' Hon. Dr. M. P. Duke (Leeward Islands) moved, and Dr. Tucker (Bermuda) seconded a resolution expressing the desirability of teaching sanitation and hygiene in the schools. Dr. Ross (Jamaica), seconded by Hon. Dr. E. F. Hatton (Windward Islands), moved a resolution to the effect that the endeavour to combat disease would be aided by the adoption of efficient registration of births, deaths and marriages.

During the deliberations of the Conference the question of bovine tuberculosis had raised some considerable discussion. There was an almost complete absence of statistics regarding the incidence of tuberculosis amongst cattle, and the concensus of opinion appeared to be that it was so small as to be almost negligible as a contributory cause of the disease in the human subject. It was however pointed out that at least in some parts of the West Indies the disease exists to a somewhat large extent, and a paper was read by Mr. P. T. Saunders, M.R.C.V.S., the delegate from the Imperial Department of Agriculture, which elicited the following remark from the President: 'I think it is definitely established that bovine tuberculosis exists in the West Indies, and it is quite clear that we must endeavour as far as possible to advise and recommend that measures should be taken to prevent the extension of the disease and the possible infection of human subjects.'

It was not surprising, therefore, to find included among the resolutions, the following one moved, by Dr. A. McDonald (Kingston City Council, Jamaica): 'That it be a recommendation of this Conference that measures be taken in the colonies and countries represented here, to stamp out bovine tuberculosis and to prevent its importation.' This was seconded by the Veterinary Officer of this Department.

It was announced at this meeting that the next conference would be held in British Guiana in 1915.

During the course of the conference the delegates addressed gatherings in the various schools, a mass meeting of some 3,000 East Indians at San Fernando, and the audience present at the annual meeting of the Trinidad Association for the Prevention and Treatment of Tuberculosis.

On Thursday March 27, a Tuberculosis Exhibition was opened by His Excellency Sir George Le Hunte, who was accompanied by Lady Le Hunte, when all the delegates were present.

Through the kindness of various local organizations and individuals, the delegates were able to partake in many excursions and functions of a social character, all of which were rendered doubly enjoyable through the consideration and attention of the Committee.

GLEANINGS.

It is probable that in Antigua there will be a fairly large increase in the acreage under cotton during the coming season. It is stated that at present there is little or no flower-bud maggot of cotton in the island.

In St. Kitts the weather during March has been showery, with very high winds. In the Northern District the canes are still very green owing to the late rains, and the returns from this locality are somewhat disappointing. Grinding commenced at the central factory on March 10.

Information is presented in the Grenada *Government Gazette* for April 1, 1913, to the effect that the Governor proposes to invite the Council to appoint a special committee respecting the establishment of a Land Bank in Grenada, suited to the conditions obtaining in that Colony.

The distribution of plants from the Botanic Station, Dominica, during March last, was as follows: limes 1,868; budded citrus 77; Para rubber 70; miscellaneous 8; making a total of 2,023 The total plant distribution for the twelve months ended March 31, 1913, was 75,146. The distribution for the same period in 1911-12 was 76,363.

An announcement is made in the Leeward Islands *Government Gazette*, for March 27, 1913, that an Ordinance has been made by the Governor-in-Council to prohibit the cutting without permit of wattle, sedge and broom straw in the island of Barbuda. The penalty for breaking the Ordinance is not exceeding £25.

Information received from the Agricultural Instructor, Nevis, indicates that the cane crop throughout the island has made very rapid progress during the past three months, especially in the case of the young canes. The old crop is now being reaped and the returns, although not very good, are much better than was anticipated. There has been a small increase in the acreage put in canes for the next crop.

A note in *Nature* for March 20, 1913, contains the information that a new eye-piece micrometer has been invented which will probably replace all others. The fundamental idea is that the scale used is such that microns can at once be read off without greatly changing the tube-lengths or considering the micrometer value of the objective employed, therefore dispensing with the arithmetic for which this is a necessary datum.

It is stated in a recent issue of the St. Croix *Avis* that at an extraordinary meeting of the Agricultural Society, Dr. Longfield Smith gave an address to the planters in which he suggested some labour-saving changes in their present system of cane cultivation. The speaker also referred to hybridization experiments with Sea Island and other species of cotton in St. Croix and elsewhere, and pointed out the economic benefits that are likely to accrue from the results obtained.

The agricultural notes in the Demerara *Argosy* for March 29, 1913, provides the information that the majority of estates will start sugar-making next month, but that only a limited area of canes are due for reaping. As regards the rice crop, the paddy is now ready for harvesting but the yield will be below the usual average. The rice market is dull and prices unremunerative to the millers who hold a considerable stock of paddy. Recent weather in Demerara has been marked by heavy showers—a welcome change after the more or less severe dry weather of the last eight weeks.

An interesting catalogue has recently been received from Messrs. Mansfield & Sons, Ltd., of Birkenhead, which describes an oil gas apparatus that may probably be found of use for providing a suitable gas-supply for laboratories which are out of the reach of an ordinary town gas-supply. It is stated that great satisfaction has resulted from the use of the following oils from which the gas is prepared by destructive distillation: creosote oil, palm oil, castor oil, coco-nut oil, Rangoon oil, fish oil, tallow and unrefined fat. The gas is stored in a gasometer similar to, but on a smaller scale than, that employed in urban gas works.

In the Antigua *Sun* a report from the Government Laboratory for the Leeward Islands intimates that a year of marked dryness in that island is recorded for 1912. The average rainfall has been the lowest since 1875, with the exception of 1905. The low precipitation experienced from the beginning of the year until September, combined to render the outlook exceedingly unfavourable, though fairly well distributed rain during the latter part of the year served to supply the needs of the population for water and also to improve the crops considerably. The average rainfall for thirty-nine years, 1874 to 1912, was 44·47 inches, so that the precipitation for 1912 is 12·24 inches below the average.

Notice of Judgement No. 150 issued from the office of the Secretary, United States Department of Agriculture, concerns the case of the marketing of citrus fruit badly damaged by frost. Citrus fruit is injured in flavour by freezing and so becomes dry and unfit for food. The damage is evidenced at first by a more or less bitter flavour, followed by a marked decrease in sugar, and especially in acid content. For the guidance of those concerned in the shipping of citrus fruit, it is announced that, pending further investigation, all citrus fruit will be deemed adulterated within the meaning of the Food and Drugs Act, if the contents of any packets are found to contain 15 per cent. or more of citrus fruit which, on a transverse section being made, the centre shows a marked drying in 20 per cent. or more of the exposed pulp.

STUDENTS' CORNER.

MAY.

First Period.

Seasonal Notes.

During this period much attention will have to be devoted to cultural operations in lime orchards. Pruning and the cutting out of dead wood must be done carefully and the cut surfaces dealt with to prevent decay. Weeding is sometimes done by means of the hoe and sometimes with the cutlass. Under what conditions is one method likely to prove more beneficial than the other? The forking of lime orchards, under certain conditions, is found to prove beneficial, but this work must only be carried out under close supervision. As was pointed out in the last series of these notes, attention should be given to the lime nursery in order to procure good healthy seedlings for planting out when the time arrives for doing so.

Most of the above remarks apply equally well to cacao orchards. Canker of the stem can be well detected in the showery weather of May and proper treatment should be applied immediately. In planting out young cacao, care should be taken to select plants which have been grown from seeds produced by trees of known resistance to disease.

The importance of good drainage has a direct bearing upon the above remarks, and constitutes an essential point in the editorial in the last issue of this journal, on The Improvement of West Indian Pastures. The subject of drainage is also dealt with in the article on Subsoil Water published in this issue of the *Agricultural News*. Figure 3 has been reproduced to illustrate the nature of the underground water-supply in limestone soils in the West Indies, and this diagram should be studied carefully in conjunction with the article on subsoil water referred to above.

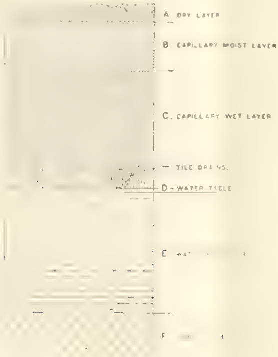

Fig. 3. Diagram Illustrating the Distribution of Water in the Soil.

In proceeding to drain a field, one of the first things to decide upon is the course of the main drain. This should run from the highest to the lowest point on moderately level land. In other words, the outlet should theoretically be at the lowest point in the field or area of orchard under treatment except, of course, in the case of hilly districts where main drainage along the line of greatest fall may result in disastrous erosion. Although the outlet can sometimes be decided upon by inspection, the best results are obtained by a system of levelling. A simple case is as follows: The piece of land to be drained is divided up into a number of imaginary squares, in chess board fashion, and the level at each intersection is carefully taken. The line which runs from the highest point to the lowest marks the course of the main drain, and in a simple case the gradation will be even from top to bottom. Reference must be made to text-books for details, but even without knowledge of surveying, considerable value will attend close observation of variations in levels, both as regards fields on one and the same estate and on different estates, and efforts should be made to correlate these results with any differences in the crops situated in the locations under examination.

Questions for Candidates.

Preliminary Questions.

(1) What is capillarity and wherein lies its importance in agriculture?

(2) Show by means of sketches the difference in the appearance of the internal arrangement of the tissues in a monocotyledon as compared with that in a dicotyledon. Why is it impossible to graft plants of the former class?

Intermediate Questions.

(1) What manures have proved of greatest use in lime cultivation? State the quantities applied per acre, and the best time for the applications. Mention on what authority you base your statements.

(2) How would you proceed to find out the cost of a pound of nitrogen and of potash (in an 'available' form)?

Final Questions.

(1) Write an essay (of about 500 words) on the conditions governing labour contracts in the Colony in which you live. Along what lines do you consider improvement possible?

(2) Relate any observations you have made on the suitability of certain varieties of sugar-cane for the different localities in any one island. Describe the system of experiments that are conducted for the purpose of ascertaining information on this question.

The Verdict of the Animal.—In a paper which has been published in *Science Progress* for January 1913, concerning a discussion on animal nutrition at the last meeting of the British Association at Dundee, it is observed that an opportunity was afforded for physiologists, agricultural chemists and practical feeders to indicate their own particular point of view on the subject for the consideration of the others. The discussion proved to be a remarkable success, the result being the conclusion that entire reliance could not be placed upon chemical analysis as an indication of the nutritive value of any particular food stuff. Only experiments with animals were believed to be final. An interesting investigation was referred to which consisted in a comparison of the feeding values of Egyptian cotton seed cake with Bombay cotton seed cake. Although the Egyptian cake had the higher value from the chemical point of view, an extensive feeding experiment, sufficient to outrange the limits of experimental error, showed that the cake of inferior composition produced the better results.

FUNGUS NOTES.

RED ROT FUNGUS AND THE SUGAR-CANE IN THE WEST INDIES.

Part II.

The objects of the following investigation into the parasitology of the red rot fungus (*Colletotrichum falcatum*) were explained in the last issue of the *Agricultural News*, and a brief historical account of previous work on the same subject was presented there. The position in regard to past results was summarized, and it was endeavoured to show the complexity of the position and the somewhat contradictory nature of the results that had been obtained.

It is now intended to proceed with a description of the inoculation work of South and Dunlop, in St. Kitts and Barbados, with a view to showing the extent to which their results agree with those obtained already by other investigators.

The preliminary experiments were carried out in St. Kitts, and it will be convenient, therefore, to deal with these first.

EXPERIMENTS IN ST. KITTS.

The inoculations were made on fifty stools of White Transparent cane, seven months old, growing strongly under ordinary estate conditions (Series A to D.) Sixty healthy cuttings of the same variety were employed in Series E. The plan and methods adopted in the experiments were as follows:—

(1) *C. falcatum* (red rot fungus).

Series A. Ten nodes and ten internodes inoculated by needle pricks. Twenty controls similarly treated without the fungus. Wounds protected with sterile budding tape.

Series B. Pin pricks made in ten nodes, without any fungus, and protected with sterile budding tape. Controls, no budding tape

Series C. Twenty inoculations on leaf scars with spores suspended in drops of water. Twenty controls.

Series D. Twenty inoculations by means of spores suspended in water sprayed in between the leaf sheaths and stem. Twenty controls.

Each inoculation was made on a separate shoot.

Series E Thirty cuttings inoculated as in Series A. Thirty controls.

(2) *Melanconium sacchari* (rind fungus).

Since this fungus is still regarded by some as the cause of a specific rind disease, it was thought advisable to repeat the above series with this organism as well.

In connexion with the methods and conditions of inoculation, the following details may be noted. Before communicating the fungus the surface of the cane was washed with strong corrosive sublimate solution for one minute, then with sterilized water and finally with alcohol. When the surface had dried, the fungus was deposited or introduced, as the case might be, with a sterile platinum loop or with a needle. The budding tape was flamed in the field before each application.

The inoculating material consisted of pure cultures of *C. falcatum* and *M. sacchari* on sweet potato and sugar-cane slabs respectively, prepared in the mycological laboratory of the Imperial Department of Agriculture at Barbados. The cultures were in a state of fructification and about a month old. The germination capacity of the spores was tested in hanging drops, and found to be satisfactory. In Series B, a second inoculation was made in each case on the day following the first inoculation in order to maintain moist conditions and abundance of spores. The different series of inoculations were made within a few days of each other under similar climatic conditions. The weather at the time of inoculation was rather dry, but heavy rains were received during the course of the experiments.

RESULTS.

In order to trace the development of the disease, two inoculated and two control shoots of each series were cut and examined every fortnight. The experiments therefore lasted about three months. It may be at once stated generally, that in these experiments there was no further development of the fungus after about the first month. The extent of the infection during this period will be gathered from the following observations.

Series A (*C. falcatum*). Fifteen inoculated canes exhibited the typical red and yellowish discoloration about 2cm. each side of the wound, two canes (after one month) had the entire internode discoloured red, with the characteristic white centre. The nodes were not penetrated. In general, the internodal infections took best. *C. falcatum* was isolated from the two latter canes, but not from the former fifteen. The remaining three inoculations gave no results. Of the controls, twelve were not discoloured, except immediately along the course of the needle wound. This was attributed in most cases to mechanical injury and oxidation. Four of the controls were discoloured as much as the inoculated canes but two of these contained moth borer in the node under experiment. No fungus could be isolated from these canes. Amongst the canes that were reaped during the latter half of the experiments were several in which the tapes had come off. Immediately this was observed, Series B was instituted to check the diagnostic value of the red discoloration. All the uncovered wounds in this series showed after three weeks nearly as much discoloration as the inoculated canes. There was no discoloration in the controls in Series B. No fungus could be isolated from the uncovered wounds, and therefore, the reddening was put down to oxidation and possibly to yeasts and bacteria. In several of the inoculated canes which might presumably be regarded as having been infected, hyphae were seen to occur in the larger vessels, and a comparison of sections of these specimens with sections of a cane bearing fructifications of *C. falcatum* made it fairly evident that this fungus had at least been partly the cause of the diseased condition in the inoculated canes from which no fungus could be isolated.

The conclusions to be drawn from the above results are as follows:—

(1) In most cases in Series A the fungus died early—probably within the first two weeks after inoculation. In the more susceptible canes, the fungus developed quickly throughout the entire internode but did not penetrate the joints

(2) Not much reliance can be placed upon the symptom of red discoloration for purposes of diagnosis, and, further, red discoloration of the tissue tunnelled by moth borer does not necessarily signify the presence of *C. falcatum.*

(3) Under the conditions of the above experiments *C. falcatum* did not show itself to be an active wound parasite. One cause may have been the resistance offered by the cane; or possibly the fungus may have become weakened through cultivation. It is not improbable that the conditions of moisture and particularly of air-supply were unfavourable for the germination of the spores and mycelial growth.

Turning now to the other series of inoculations, it was found that in the case of Series C and D, the fungus was in every instance unable to infect the cane. This result supports the general opinion that *C. falcatum* is a wound parasite.

In the case of the inoculated cuttings, however, the results were more complicated. At the end of eighty-three days all the inoculated cuttings had become reddened in every node, whereas only fourteen or about half of the controls had become similarly discoloured in every node; and even when this had taken place it was not as general nor as intensive as in the inoculated cuttings. In the controls a white healthy strand of tissue was generally to be seen extending along the side of the cutting from which the shoots arose. This was not noticed in the inoculated cuttings. Of the inoculated plants eight growing points were found to be diseased at the end of eighty-three days; a similar condition was observed in two controls. The tissue appeared red and decomposed, in some cases black and completely disorganized. Red strands connected this area with the diseased tissue of the cuttings In the case of the shoot of onn inoculated cutting, *C. falcatum* was found to be present, but it was not possible to isolate the fungus in every instance; it was isolated however from the tissue of two inoculated cuttings, but was apparently absent from the controls to these.

As regards the field characters of the plants, it was found that the controls weighed heavier, had more shoots, and presented generally a more healthy appearance than the inoculated plants.

Although the above results may be somewhat inconclusive as regards the question of the communication of *C falcatum* from the cutting to the developing shoot, it would seem clear that occasionally this may occur, and that at any rate inoculation tends to check the growth of the young shoots.

Lastly, in connexion with the repetition of the entire experiments with *M. sacchari*, it was found that only six of the inoculated canes in Series A showed any discoloration, and this was generally rather blackish than red and only slight in extent. Six of the controls exhibited a similar appearance. No fungus could be isolated.

In Series C, D and E no infections were observed, showing fairly conclusively that *M. sacchari*, under the conditions of these experiments, is not a parasite.

Whilst it was believed that the results of the experiments so far described shed a little more light upon the relations existing between *C. falcatum* and the sugar-cane in the West Indies, yet it was felt that further investigation in connexion with infected cuttings was desirable in view of the inconclusive results and the economic importance of the matter. Accordingly, arrangements were made to carry out, in Barbados, more comprehensive experiments with cuttings from four different varieties of sugar-cane, namely, B.147, B.376, Bourbon and White Transparent. In the next issue of the *Agricultural News* an account will be given of the results obtained in these experiments, and a final summary will be presented of the position in regard to the parasitology of *C. falcatum* as it stands at present.

It is stated in *The Board of Trade Journal* for January 9, 1913, that the baobab tree (*Adansonia digitata*) grows in immense clusters or small forests near the sea at Dakar. The fibrous part of this tree makes a paper of superior quality and durability suitable for banknotes, and it is also added to other pulps in small quantities to impart a gloss and finish to the paper. As a result the fibre is much sought after in the United Kingdom and still more so in Germany. The tree occurs in the West Indies.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

The Report of Mr. J. R. Jackson is as follows:—

Little or no change can be reported on the condition of trade in Mincing Lane since our last report, either generally, or in the matter of any individual product, due in the former instance, to the continuance of hostilities in the near East, and the consequent unsettlement of the European Powers, and in the second place to the occurrence of the Easter holidays, when buyers are always scarce, and the offerings of goods limited. The dealings in spices have been markedly inactive.

GINGER.

At the first auction on the 5th, 269 bags of Cochin, fair to good washed rough were offered, and all bought in at 33*s*., to 35*s*. per cwt. A week later the offerings amounted to 320 bags of washed Cochin which were bought in at 33*s*. to 35*s*. for fair part slightly mouldy, and 32*s*. for wormy.

NUTMEGS AND MACE.

No offerings of nutmegs were made at the first spice auction, but on the 12th of the month 185 packages of West Indian were brought forward and 140 sold, 66's fetching 6*d*. per lb.; 72's to 80's, 6*d*. to 6½*d*.; 81's to 88's 5¾*d*. to 6½*d*.; 99's to 108's 5½*d* to 6*d*. and 124's to 136's, 5¼*d*. to 5½*d*. There was a steady demand for mace at the first auction on the 5th of the month, 10 packages of West Indian were disposed of, 2*s*. 5*d*. being paid for good, 2*s*. 3*d*. for fair, and 1*s*. 11*d*. for broken. Ten cases of fair flat Java were bought in at 2*s*. 7*d*. per lb. A week later, namely on the 12th, West Indian mace was represented by 12 packages which were disposed of at 2*s*. 3*d*. for fair pale and reddish, and 2*s*. to 2*s*. 1*d*. for dark red.

SARSAPARILLA.

At the first drug auction on March 6 there was a steady demand for grey Jamaica and Lima Jamaica, the former fetching about 2*d*. advance on previous rates, and realizing 2*s* 7*d*. per lb. for 2 bales of slightly rough and 2*s*. 5*d*. per lb. for 6 bales of fair fibrous, 8 bales being all that were offered. Sixteen bales of Lima Jamaica were brought forward and all sold at an advance of from 4*d*. to 5*d*., fetching 2*s* 2*d*. to 2*s*. 3*d*. per lb.; 22 bales of native Jamaica were offered but 5 only found buyers, good red fetching 10*d* and mixed greyish 9*d*. per lb. A fortnight later, namely on the 18th, the offerings consisted only of 5 bales of grey Jamaica and 1 of Lima Jamaica. All were sold, the former at 2*s*. 5*d*. per lb. and the latter at 2*s*. It was stated at the end of the month that some 20 bales of grey and native Jamaica had arrived and would appear at the first drug auction in April.

LIME OIL AND LIME JUICE.

It was announced in the early part of the month that 41 packages of lime oil had arrived from Dominica; a portion of which was sold at the end of the month at 11*s*. 6*d*. per lb. for hand pressed. There has been a fair demand for lime juice, at the first auction on the 5th, 22 packages were offered two of fair raw Jamaica fetching 1*s*. 7*d*. per lb. and 7 of ordinary brown pulpy for which 1*s*. 5*d*. per lb. was paid.

MARKET REPORTS.

London.—The West India Committee Circular, April 8, 1913; Messrs. E. A. de Ross & Co., March 28, 1913.

Arrowroot—3$\frac{15}{16}$*d.* to 5*d.*

Balata—Sheet, 3/1; block, 2/1 per lb.

Beeswax—£7 15*s.* to £7 17*s.* 6*d.*

Cacao—Trinidad, 71/- to 81/- per cwt.; Grenada, 63/- to 68/-; Jamaica, 62/- to 70/-.

Coffee—Jamaica, 65/- to 75/-.

Copra—West Indian, £31 per ton.

Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 19*d.* to 20*d.*

Fruit—No quotations.

Fustic—No quotations.

Ginger—Quiet. 42/- to 62/-.

Isinglass—No quotations.

Honey—No quotations.

Lime Juice—Raw, 1/6 to 1/10; concentrated, £24 to £25; otto of limes (hand-pressed), 10/6.

Logwood—No quotations.

Mace—2/3 to 2/4.

Nutmegs—5¾*d.* to 6½*d.*

Pimento—2⅛*d.* to 2⅜*d.*

Rubber—Para, fine hard, 3/5; fine soft, 3/5; Castilloa, 2/9 per lb.

Rum—Jamaica, no quotations.

New York.—Messrs. Gillespie Bros. & Co., April 4, 1913.

Cacao—Caracas, 14½c. to 15c.; Grenada, 14c. to 14½c; Trinidad, no quotations; Jamaica, 12¼c. to 13¾c.

Coco-nuts—Trinidad and Jamaica, selects, $35·00 to $36·00; culls, $23·00 to $24·00 per M.

Coffee—Jamaica, 13c. to 15c. per lb.

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Grape Fruit—Jamaica, $2·50 to $3·00.

Limes—$6·00 to $6·75.

Mace—48c. to 53c. per lb.

Nutmegs—110's, 12c.

Oranges—Jamaica, $2·75 to $3·25 per box.

Pimento—4c. per lb.

Sugar—Centrifugals, 96°, 3·45c. per lb.; Muscovados, 89°, 2·95c.; Molasses, 89°, 2·70c. per lb., all duty paid

Trinidad.—Messrs. Gordon, Grant & Co., April 14, 1913.

Cacao—Venezuelan, $14·75 per fanega; Trinidad, $14·25 to $14·60 per fanega.

Coco-nut Oil—$1·10 per Imperial gallon.

Coffee—Venezuelan, 15c. per lb.

Copra—$4·60 per 100 lb.

Dhal—$4·25.

Onions—$1·50 to $3·00 per 100 lb.

Peas, Split—$6·25 per bag.

Potatoes—English, $1·40 to $1·80 per 100 lb.

Rice—Yellow, $5·25 to $5·40; White, $6·75 per bag.

Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., April 19, 1913; Messrs. T. S. Garraway & Co., April 21.

Arrowroot—$4·75 to $7·50 per 100 lb.

Cacao—$14·00 per 100 lb.

Coco-nuts—$16·00

Hay—$1·50 per 100 lb.

Manures—Nitrate of soda, none; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $85·00 per ton.

Molasses—No quotations.

Onions—$1·25 to $2·80 per 100 lb.

Peas, Split—$6·00 to $6·25 per bag of 210 lb.; Canada, $4·40 per bag of 120 lb.

Potatoes—Nova Scotia, $2·40 to $3·00 per 160 lb.

Rice—Ballam, $5·15 to $5·40 per 190 lb.; Patna, no quotations; Rangoon, no quotations.

Sugar—American granulated, $4·00 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, April 12, 1913; Messrs. Sandbach, Parker & Co., April 10, 1913.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	8c. per lb.	—
Balata—Venezuela block	No quotation	—
Demerara sheet	70c. per lb.	—
Cacao—Native	18c. per lb.	19c. per lb.
Cassava—	96c.	—
Cassava Starch—	$6·50	—
Coco-nuts—	$16 to $20 per M.	$10 to $16 per M.
Coffee—Creole	17c. to 18c. per lb.	18c. per lb.
Jamaica and Rio	18c. per lb.	19c. per lb.
Liberian	13½c. per lb.	13c. per lb.
Dhal—	$3·75 to $4·00 per bag of 168 lb.	$3·75 to $4·00 bag of 168 lb.
Green Dhal	$5·00	—
Eddoes—	72c. to $1·00	—
Molasses—Yellow	None	—
Onions—Teneriffe	—	—
Madeira	7c. to 8c. per lb.	7c. to 8c. per lb.
Peas—Split	$6·75 per bag (210 lb.)	$7·50 per bag (210 lb.)
Marseilles	—	—
Plantains—	24c. to 60c.	—
Potatoes—Nova Scotia	$2·60	$2·80
Lisbon	—	—
Potatoes-Sweet, B'bados	$1·20 per bag	—
Rice—Ballam	No quotation	—
Creole	$4·75 to $5·00	$5·00
Tannias—	$1·20	—
Yams—White	$1·96	—
Buck	$1·68	—
Sugar—Dark crystals	$2·25 to $2·30	$2·40
Yellow	$3·40 to $3·60	$3·50
White	$3·75 to $4·00	$5·00
Molasses		—
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	—

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AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XII. No. 288. BARBADOS, MAY 10, 1913. PRICE 1*d*

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Uniformity in Cotton Production

THE original conception of agriculture as a means of livelihood was based in primitive times on the idea that every man should grow his own necessities for existence, and exchange whatever surplus there might be left, for luxuries or for any essential articles he himself might find a difficulty in producing. But with the development of industrial organization and the increase in the number and the specialization of commodities, the difficulties of barter and exchange necessitated the use of free money, the establishment of open markets; and in the course of economic evolution, the agriculturist has come gradually to devote his attention more and more to the production of only one or two kinds of raw material, which are sold on the open market for what money they will bring, the proceeds being expended on those necessities which were formerly produced by every man.

In some lines of agriculture this specialization has proceeded farther than in others. The fruit grower, for instance, may satisfy his own personal requirements in regard to fruit, the sugar planter may not have to purchase all the sugar he requires for personal use, but the cotton-grower is placed in the extreme position of a producer who is entirely dependent upon the general consumers and, what is often overlooked, is entirely out of touch with them as a class. In fact, the cultivation of cotton on a large scale is essentially a modern development resting upon industrial organization in manufacture and the improvement of machinery. Knowledge of cotton has declined. The average consumer to-day, is generally unfamiliar with the ways of production and manufacture of the cloth which he uses, and is consequently unaware of the true value of the class of material he purchases.

It is not too much to say that the waste in the consumption of low grade material would scarcely be permitted if it were understood that stronger and more durable cotton were obtainable in sufficient quantities. It is true that from the manufacturer's point of view the quick wearing out of cheap material may increase the demand and frequently bring larger returns for the manufacturers, but though such a disregard for the interests of the consumer may gain temporary profits, yet it cannot be expected that those manufacturers who use inferior grades would not welcome a general increased supply of higher grade lint, in order to establish their industry on a more permanent basis of prosperity. It is therefore desirable in the first place that the producers should assert themselves in the direction of general co-operation, with a view to producing in different localities a uniform grade of high class cotton, and if possible obtain some guarantee that inferior lint does not go to the consumer in the form of material which is not representative of the grade of produce employed in its manufacture.

Before any progress can be made in a matter of this kind it is essential that every cotton-growing locality should produce the best type of cotton in uniform commercial quantities.

A great deal of attention in the past has been given to the agricultural selection of cotton. In the case of the Sea Island type there has been a general improvement in quality and yield and several localities in the West Indies have established a reputation for the production of extremely high grade material. But even with Sea Island cotton, there are grades the improvement of which is frequently limited by soil and climate. In time this may be overcome by improved methods of selection and cultivation, but for the present the circumstance serves to illustrate the existence of commercial grades in different communities even in the case of Sea Island cotton, and it would seem to be desirable that efforts should be made to ensure uniformity in the production of the best possible quality. The achievement of this end necessitates the co-operation of a large number of growers determined to meet a definite demand for a definite commercial grade. Such a standardization facilitates the sale of the produce; it is indirectly of great benefit as regards production.

The first essential in creating uniformity in the grade of cotton is for communities to produce their own seed. As an example of what can be done in this matter, reference may be made to St. Vincent where the cotton industry has already attained a high degree of organization. The growers in this Colony depend for their seed supply upon selected plants in fields which have produced lint of a high value and fixed grade the previous season. The seed is ginned separately; it is afterwards selected by women specially trained in the operation; and before planting, the germination capacity is determined by experiment in order to secure a quickly and evenly established crop. The peasant growers in this island, obtain at a small cost, seed selected from their produce at the Government Central Ginnery, so that in every way uniformity as regards seed is rigidly assured. It may be added in this connexion, that one of the more obvious advantages that accrues from the planting of graded seed is that, although cross-pollination may occur during the flowering period—and from results obtained in Montserrat this appears to take place to the extent of 20 per cent. of the total flowers—it is not likely to interfere seriously with uniformity in the type of lint.

Occasionally it becomes necessary and advantageous to ensure uniformity by means of legislation. Again it will serve purposes of illustration to refer to measures that have been taken in this direction in St. Vincent. The Agricultural Products Protection Ordinance requires every grower to send in returns on or before September 30 of each year, of the acreage planted, thereby enabling reliable forecasts to be made for statistical purposes. There is also in this Colony a Plant Disease Ordinance under the provisions of which all growers are required to destroy by fire, on or before April 30 of each year, all cotton bushes that were planted or growing during the previous season. A third law in this island compels small growers to sell all lots of seed-cotton less than 100 lb. in weight to the Government Cotton Ginnery. The object of this latter Ordinance is to put an efficient check upon praedial larceny.

Finally we may turn from the above considerations to the question of education in regard to uniform production. In its broadest aspect any attempt at uniformity has itself an educational value, particularly in the case of the rising generation, who, being brought up under the the influence of co-operative action are likely to respond, later on, more quickly to fresh ideas in the same direction. Localized industries have also a hereditary influence, and because of this it is always desirable that imported labour should not be employed, and concerted action should therefore be taken to establish villages and settlements in order to provide a permanent source of local supply. Technical education has also its value. Action has already been taken to provide instruction in agricultural science in the rural schools, but more solid progress might perhaps be made in this direction if the instruction were based more directly upon the principles governing the cultivation of the crop in which the community has specialized. Higher forms of education might usefully include a systematic study of the economics of agriculture, in contra-distinction to the study of natural science, and in any large educational institution that may, in the near future, be established in the Tropics, the provision of a lecturer who possesses a first hand acquaintance with the organization of the different manufacturing industries dependent on tropical produce, would be at least one way of helping to bridge the gap that at present separates the producer of raw material—in particular the producer of cotton—from the centres of retail consumption located in the large cities.

SUGAR INDUSTRY.

MULTIPLE MILLS.

Dr. W. E. Cross has lately contributed to the *Louisiana Planter* an article entitled Recent Progress in the Cane-sugar Industry, which is concerned mainly with the subject of the advantages of multiple milling. It is put forward as practical evidence of support, that modern high grade mills are very often found, especially in tropical countries, in factories which are in other respects somewhat primitive. The advantages, or rather the actual efficiency of multiple milling is indicated in the article referred to, by the inclusion of a table of extraction figures, the result of comparative observations on nine- and six-roller mills in Louisiana. Stated shortly, a nine-roller mill (length 6 feet) ground 43·2 tons of cane per hour with a juice extraction of 79·15, and with a percentage loss of sucrose of 4·27 lb.; whereas the six-roller mill (length 7 feet) ground only 39·61 tons of cane per hour, gave a juice extraction of 77·45 per cent., and a percentage loss of sucrose amounting to 5·02 lb.

Moreover, it is pointed out that if it be desired to hasten the grinding, the nine-roller mill can grind more cane than the other with the same extraction, as the following figures show: six-roller mill with crusher, 950 tons per day; nine-roller mill with crusher, 1,214 tons per day; twelve-roller mill with crusher, 1,478 tons per day. Not only is better extraction obtained but the megass, by passing through the fourth set of rollers, is dried much more thoroughly, and its fuel value, therefore, so much increased, that it produces more than enough extra steam to drive the fourth mill.

Referring to the reports on multiple milling that have been issued from Java and Hawaii, it is pointed out, first, that in the former country during the last five years, the high level of 91 per cent. extraction (juice on juice) has been maintained, and that the sugar lost in the megass has been steadily kept down to a low limit. In Louisiana objections are constantly raised against the use of nine- and twelve roller mills because, it is said, the purity of the Louisiana juice is too low, and the increased extraction would result in a smaller percentage of actually available sugar. The figures of Noel Deerr, however, show this idea to be wrong; for although the last mill juice is of a purity considerably lower than that of the first mill juice. yet the purity of the total (i.e. mixed) juice is only very slightly lower.

As regards the Hawaiian reports, extremely interesting and valuable new data have arisen from a comparison of the efficiency of a twenty-one-roller mill with the twelve and eighteen. It would appear that the larger multiple mill gives nearly 1 per cent. greater extraction, with a dilution of 51·5 per cent, as against 37·7 per cent. extraction in the case of the latter kinds. Moreover, the weight of cane ground per linear foot is 9 for the twenty-one roller mill as compared with 6·2 for the twelve, thus conclusively showing the far greater capacity of the larger combination.

DAMAGE TO SUGAR-CANE BY FIRE.

The burning of cane either by accident or design has become so common in certain districts in Queensland that it was resolved at the recent conference of the Australian Sugar Producers' Association in Brisbane to ask the Council to deal in an adequate and prompt manner with the whole matter at their next meeting.

In the *Australian Sugar Journal* for March 6, 1913, where the subject is referred to at some length, it is stated that recent analyses have shown that losses from burning occur to the following extent. In the first place there is a loss in weight which is never less than 4 per cent. and, on the average, probably as high as 6 or 7 per cent. Accompanying this, there is an increase in the percentage of fibre which leads to corresponding difficulties as regards extraction Moreover, the deterioration in the field is more rapid in the case of burnt canes than in the case of green canes cut and left in the same way. Furthermore, an average interval of three days between burning and milling causes a minimum average reduction in value of 20 per cent. In one experiment, during ten days the following changes were found to have taken place: on the day of burning the analysis was: Brix., 24·19; sucrose, 22·36; quotient of purity, 92·43; glucose, ·41; glucose ratio 1·83; per cent. sucrose in cane, 17·92. On the tenth day, analysis gave the following result: Brix, 20·59; sucrose, 14·95; quotient of purity, 72·61; glucose, 4·17; glucose ratio, 27·89; per cent. sucrose in cane, 10·07.

It is stated further that practical experience supports the above figures, since on several estates it is taking from 10 to 12 tons of burnt cane to make a ton of sugar, whereas of green cane only 7 tons are required.

A REVERSIBLE BARREL.

The invention described in the following extract, taken from the *International Sugar Journal*, for March 1913, is likely to be of great economic importance in tropical agriculture. It may solve the difficulties incident on the shipping of low grade molasses, and may prove to be an extremely profitable factor in the exportation of lime juice and similar agricultural produce:—

A patent has recently been taken out for what is described as a reversible barrel. It consists of two equal-sized conical steel halves bolted together in the middle at a joint consisting of an elastic and chemical proof Dermatine ring lying in a groove. The principal advantage of this design is that, in returning empties, the halves can be nested one in another and so take up far less space. Steel barrels for holding 10 cwt. of molasses and weighing themselves 2 cwt each are returned empty to Natal at a freight charge of 7*s.* 6*d.* each; nested barrels of the same capacity would go for 2*s.* 6*d.* Again, mineral oil barrels which would cost £1 17*s.* 6*d* to return to the United States (the charge being by space), could be replaced by nesting barrels which travelling by weight would cost 5*s.* to return empty. There are other advantages claimed for this patent barrel, such as the ability to clean and coat the insides. All halves are interchangeable, any two will make a barrel, or single halves may be used with a cover plate.

FRUITS AND FRUIT TREES.

THE FLOWERING OF THE MANGO.

A note in the *Agricultural Journal of India*, for January 1913, gives attention to periodicity in the flowering of different varieties of mango in that country. It is pointed out first that, although most mango trees will flower more or less every year, there is no foundation for saying that any particular variety possesses a fixed character of normally flowering every year and producing heavy yields of fruit. The fixation of a definite character of this nature would appear to solve what is at present a great drawback to mango cultivation in India. It is pointed out that the real test would be to find out if such a character were hereditary or not In the opinion of the writer of the article referred to—the Superintendent of the Botanical Gardens at Saharanpur—the character is not hereditary, being subject rather to variation through environment than to the transmission of any definite factor. Of nearly sixty varieties observed in 1911, the difference between the earliest and the last to begin to flower was only twenty-five days. Of the first six to flower earliest, the average duration of flowering was thirty days; whereas in the case of the six varieties to flower latest, the average was only twelve days.

The inferred cause is the increase in temperature for the period of the year—February 20 to March 20—on which dates the earliest and latest varieties flowered respectively. Other observations tended to support the contention that alternation in bearing is primarily due to over production, with a consequent exhaustion, followed by recoupment. Incidentally the important fact is pointed out that rain at the time of heavy flowering spoils pollination. This is one cause which may explain the frequent inability of flowers to set fruit in the West Indies.

TREATMENT OF STORM-DAMAGED CACAO TREES.

Some rather useful hints on the above subject have appeared in a recent issue of the *Journal of the Jamaica Agricultural Society* (January 1913), and the following information, derived from this source, forms a fitting sequel to a previous note in the above journal, on the damage to annual crops by hurricanes, which was abstracted in the *Agricultural News* (Vol. XII, p. 88).

In cases where damage has been caused to branches of cacao trees by the falling of heavy obstacles on them, the wounds should be smoothed over with a sharp knife and then covered with tar to prevent water soaking in. The smoothing enables the tree to repair the broken part more readily. In other cases where young cacao trees, not in bearing, have been blown over, a stake should be driven in the ground and the tree carefully tied to this support. If a gap has been made in the soil around the base of the tree it should be filled in with loose earth, but no attempt should be made to mould up.

Large cacao trees which have been blown down are not quite so easily treated. The best procedure appears to be as follows. A short stout stake with an open crutch at the top is obtained, and driven in the ground at a convenient distance along the line of the prostrate trunk. The tree is then gently raised so that the stem rests in the crutch, whilst the branches and leaves are for the most part lifted off the ground. Under this arrangement the tree will either continue giving, or soon begin producing fruit. In this position, however, the plant is unsightly and cumbrous, consequently a young shoot or 'gormondizer' should be encouraged to grow as near as possible to the base of the trunk. All other shoots should be pruned off as soon as they appear. In about eighteen months this new stem will begin to bear fruit, and then the old tree can be conveniently and profitably cut away.

Notice of Judgment No. 2,112 (United States Department of Agriculture) concerns an interesting case of adulteration and misbranding of extract of nutmeg. The product was labelled: Pure Triple Strength Extract Nutmeg. Analysis of a sample by the Bureau of Chemistry showed the following results: alcohol, 45·7 per cent.; solids, 0·33 per cent.; oil of nutmeg 0·16 per cent. The misbranding was alleged for the reason that the label was false and misleading in that the product was not of standard strength, being in fact a highly dilute extract containing a large quantity of alcohol.

VETERINARY NOTES.

HOOK WORM DISEASE IN SHEEP AND OTHER ANIMALS.*

The existence of this disease in the West Indies has been proved on some few occasions, and the purpose of the present article is to place on record such observations as have been made, and to summarize the position for the information of planters and other stock owners who may be unacquainted with the literature of the disease.

In local synonymy, the name most commonly applied is 'mumps', under which it is known in St. Lucia and elsewhere; also 'la gomme', by which it is called in Dominica.

The various species of worms which cause the disease in different animals belong to the genus Oesophagostomum, of the sub-family Strongylinae, family Strongylidae, of the nematoda. The Oesophagostoma are thread-like in appearance, the length being about thirty to forty times the thickness. They vary in length from $\frac{1}{3}$- to 1 inch, the female being somewhat longer and thicker than the male. They are cylindrical in shape and taper to a point at both ends. Two at least of the more commonly known species have their anterior ends bent into a hook, hence the name hook worm. Not much is known as to their life-cycle. The eggs pass from the body of the host in the faeces; after a time the egg develops into a young embryo, in which stage it is ingested into the host with food or water, and becomes attached to the mucous lining of the intestine. One species, *Oesophagostomum columbianum*, burrows through into the sub-mucous coat of the intestine and there produces a nodule—the well known nodular disease of the intestine.

Of the different species occurring in the West Indies, *Oesphagostomum venulosum* is thought to be the cause of 'la gomme' in Dominica, and *Oesophagostomum columbianum* is believed to cause nodular disease in St. Lucia and St. Vincent. It should be borne in mind that cattle and other animals are affected by similar parasites.

The first symptom usually observed is a loss of condition and general unthriftiness from the loss of blood caused by the irritation and sucking of blood on the part of the worms. Later the animal becomes thin and almost emaciated, evinces great weakness and cachexia, and shows an almost constant tendency to lie down. By this time the disease is nearly always apparent from the pendulous abdomen and a marked pallor of the visible mucous membranes. The most marked symptom, however, is the dropsical swelling in the throat, from which apparently the terms 'la gomme' and 'mumes' are derived. There is a chronic enteritis (inflammation of the bowels) accompanied by a watery diarrhoea. Death may occur in three or four months while the animal is in a comatose condition.

Diagnosis depends on the weakness, pendulous abdomen, throat swelling, and the detection of the worms or their eggs in the faeces.

The treatment of this disease has not up to the present yielded satisfactory results. The administration of thymol beta-naphthol, arsenic or tartrate of antimony will expel the worms, but will have little or no effect on the larvae encysted in the wall of the intestine. The agent which has given the most satisfactory results, and the one most commonly advised, is thymol. For sheep this drug is given in doses of 20 to 30 grains, varying with age; it should be given in suspension in glycerine or milk, on an empty stomach, for four or five mornings, and then followed by a laxative such as 1 to 3 oz. of epsom salts. Individual animals should also be treated according to the symptoms they show. Diarrhoea may be checked by astringents and demulcents. In all cases it is advisable to use a liberal supply of rock salt and tonics such as sulphate of iron. Good nursing and nourishing foods are essential.

On examining a dead sheep the anaemia which was evident in life is seen to be profound, the blood being deficient in quantity and its colour being much paler than normal; the flesh also is pale. The dropsy is seen to be general, but is most apparent in the throat where it completely invades the tissues. A considerable amount of fluid is usually found in the abdomen, the lungs suffer from the general oedema, and a piece of lung may sink in water

In nodular disease small elevations of the serous surface of the bowel are found, varying up to $\frac{1}{3}$-inch in size and raised about $\frac{1}{8}$-inch or more above the surface. They may be seen throughout the entire length of the intestine, from the duodenum to the rectum, but they are commonest perhaps in the caecum and colon. Similar small areas are found occasionally, more particularly in well advanced cases, in the liver, the mesenteric glands and the lymphatic glands of the pelvis. In 'la gomme' there are no nodules so far as limited observations have made apparent, which fact suggests some difference in the life-cycle. The adult worm, however, is found in the intestine in large quantities.

If a pasture or a water-supply is known or suspected to be infected, all animals should if possible be removed for several years till the parasites die out. The pastures should be well drained, leaving no stagnant pools, and a top dressing of lime or salt should be applied. Weeds and rank grass should be cut down and burnt. It is advisable to cultivate such land under Guinea corn, sweet potatoes and similar crops, in rotation with pasture grass. The disease is most common on damp low-lying pastures, the eggs requiring moisture for their development; hence the most dangerous places of infection are round the drinking pools, and a good supply of clean water should be provided in their place by means of troughs. A pasture which is free from the disease should not be stocked with infected animals, but care should be taken that animals going out to a new pasture should be examined for the disease and, if found to be affected, subjected to a course of treatment. The intestinal contents of slaughtered animals should be destroyed, or so disposed of as to prevent further contamination. It should also be borne in mind that good nutritious food is probably the best preventive of serious loss from the infestation, and efforts should be made to ensure the best possible condition of all animals

It might serve a useful purpose if planters and others in these islands would forward to the agricultural officer of the Colony in which they reside, any specimens found which appear to have a bearing on this disease, together with short notes embodying the observations made.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados by the R.M.S. 'Tagus', on May 5, for an official visit to St. Lucia. Dr. Watts is expected to return on or about May 12.

Mr. P. T. Saunders, M.R.C.V.S. left Barbados for Antigua by the S.S. 'Korona', on April 25, in order to make investigations in the Leeward Islands regarding certain diseases of live stock

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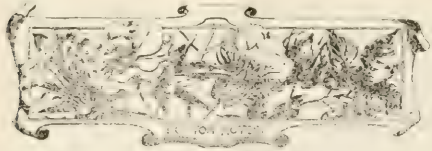
* A further reference to worms in sheep will be found on page 150 of this issue.



WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date April 21, with reference to the sales of West Indian Sea Island cotton :—

During the past fortnight a good business has been done in West Indian Sea Island cotton and prices are fairly steady for the medium qualities and very firm for the finer sorts.

The sales amount to over 400 bales and include Montserrat, Anguilla, St. Kitts, Nevis and Tobago 17*d.* to 18*d.*, Barbados 19*d.* to 20*d.*, with a few exceptionally good lots 22*d.* to 22½*d.*, a few St. Vincent at 22½*d.*, and a few Antigua 19*d.* with an exceptionally fine parcel at 22½*d.*

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending April 12, is as follows:—

There was a limited demand for the Planters' crop lots, resulting in the sale of two small crops at 30c. for France, which together with a lot of full Extra fine at 28c , made up the above sales.

Since the close of the report there has been some enquiry for the odd bags off in preparation, but at prices below the views of the Factors now holding the larger portion of the unsold stock.

We quote, viz:

Extra Fine	28c. to 29c.	= 16*d.* to 16½*d.*	c.i.f., & 5 per cent.
Fully Fine	26c. to 27c.	= 14¾*d.* to 15¼*d.*	,, ,, ,, ,,
Fine	25c.	= 14¼*d.*	,, ,, ,, ,,
Extra Fine off in preparation	22c.	= 12½*d.*	,, ,, ,, ,,
Fully Fine off in preparation	18c. to 20c.	= 10½*d.* to 11½*d.*	,, ,, ,, ,,
Fine off in preparation	18c.	= 10½*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to April 12, 1913, were 501 bales, 1,637 bales, and 4,108 bales, respectively.

Experiments have been conducted in Hawaii to test the value of dynamite in opening up impervious subsoil which occurs in certain parts of that territory. A low velocity 25 per cent. dynamite was used, the sticks being 1¼-inch in diameter by 8 inches long, and placed to a depth of about 2½ feet, varying with the nature and condition of the soil. The results obtained were satisfactory, the subsoil was opened up, and the cost of the experiment was about 3c. per hole, thus making the cost of 8 feet × 8 feet spacing (the usual distance) $20·40 per acre. In preparing the land for planting, the ordinary ploughing and cultivating operations have to be performed in addition. (From the *Experiment Station Record*, February 1913.)

HEREDITY AND MUTATION.

In his fifth lecture at the Royal College of Science Dr. Gates described the mutations obtained by Tower in various species of potato beetle (Leptinotarsa), and also those discovered by Morgan in the vinegar fly (*Drosophila ampelophila*). The eyes are normally red, and mutations were obtained by the successive dropping out of factors, giving races with pink, vermilion, orange, and 'eosin' eyes. Four mutations in body colour, and no less than nine in wing characters, appeared.

The experiments of Blaringhem in producing mutations in maize as a result of mutilations or traumatisms were referred to; also the work of Klebs, who in certain cases obtained new types, which bred true, by subjecting species of Sempervivum to light of various colours.

Regarding the causes of mutations, it is evident that the germ plasm, like all protoplasm, is responsive to stimuli, so that various environmental changes may induce mutations but it is probable that, for the germ cells to be affected, the stimuli must be applied at the time when they are maturing.

Nothing is yet known concerning the cause of 'spontaneous' mutations in pure lines. In Oenothera, the chromosome distributions are evidently concerned in the origin of various forms and the condition of germinal instability which exists in *O. Lamarckiana* and other Oenotheras, has probably been induced by previous crossing. When it becomes possible to control the production of mutations, we shall have made an advance of great practical value in plant and animal breeding The first step to this is a knowledge of the causes of mutations and the nature of the germinal change which occurs when any mutation originates. (Taken from the *Gardeners' Chronicle* for March 29, 1913.)

WORMS IN SHEEP.

Some interesting experiments conducted with the object of investigating the following points in connexion with worms in sheep, have recently been carried out in New South Wales and are described in the *Agricultural Gazette of New South Wales* for February 3, 1913.

In the first place the danger of eating the flesh of a sheep which had been treated with arsenic given as a vermifuge was enquired into, and analysis showed that neither the muscles nor the intestinal organs contained any trace of the drug after slaughter.

Another experiment was undertaken to test the efficacy of sulphur inhalations for lung-worms in sheep. It was proved that this method was very effective, the sheep in the majority of cases losing their cough, and a general improvement in condition being also noticed.

The third investigation dealt with the value of different drenches for stomach and intestinal worms, and the definite conclusion was arrived at that: 'drenching is particularly useful in those cases of mortality due to worms, which occur at the beginning of the infestation.' In the latter stages, however, when the ill effects are due to the progressively increasing poverty and anaemia, which a long-continued and severe infestation brings about, good nutritious food was considered to be of much more service than the administration of drugs.

ST. VINCENT: REPORT ON THE AGRICULTURAL DEPARTMENT, 1911-12.

Perusal of this publication will show that the subject-matter has been arranged under a system of headings having a wider significance than those used in former reports, whilst details of administration and similar information have been placed so that the subjects which are of more lively interest may be brought forward prominently.

The first section of the report concerns work carried out in the Botanic Gardens. Reference may be made to the efforts it describes in the distribution of fungus parasites of scale insects, namely *Cephalosporium lecanii* and the white-headed fungus (*Ophionectria coccicola*). A considerable number of new plants have been introduced including the butter or tallow tree (*Pentadesma butyracea*), Bermuda Cedar (*Juniperus bermudiana*), from Bermuda, and several species of Opuntias and Agaves from Montserrat. As regards plant distribution, cacao plants in pots constitute the most important feature; altogether 1,203 various plants (in pots) and 6,698 various plants and cuttings (not in pots) were sent out during 1911-12.

The succeeding section deals with plot experiments, the most important of which are those conducted at the Agricultural School Experiment Station. Attention is given chiefly to cotton, and the most important work with this plant was carried out in connexion with the selection of different local types of Sea Island cotton for resistance to disease. There is little to record in detail in regard to the results of these experiment since they have not been in progress long enough. Useful results are, however, anticipated. Other kinds of cotton plots were Thornton's Hybrid F. 1, Sakellarides Egyptian, Nyasaland, Southern Cross Upland and an indigenous tree cotton. Of these, all except Thornton's, Hybrid failed owing to susceptibility to disease. The fact was clearly brought out in these trials that the local Sea Island variety has become well acclimatized to local conditions.

The notes, which follow, on economic plants, contain references to the suitability of pigeon pea as a green dressing in comparison with the large number of other leguminous plants experimented with. Interesting facts are also given concerning the fruiting of male nutmeg trees. It appears that in St. Vincent male trees are frequently found to bear two or three fruits, though the majority of the flowers exhibit no abnormal structure. The subject has been referred to in the *Agricultural News*, Vol. X, pp. 324, and 388. Mention is also made of the great durability of Bermuda cedar wood already referred to. Seedlings of this useful tree had been planted in the Botanic Garden.

The next six pages of the report contain an account by Mr. F. W. South, B.A., Mycologist on the Staff of the Imperial Department of Agriculture, of the arrowroot disease, and certain affections of the cacao tree. A description is also given in this section of the black scale pest of cotton.

The account of the progress in the chief industries which is dealt with next is largely taken up with cotton. The exceptionally heavy rainfall of the year under review has been the cause, unfortunately, of the reduced yield of this staple as is indicated by the following figures: 1908-9, 124 lb. of lint per acre, rainfall, 89·06 inches; 1909-10, 141 lb., rainfall 91·05 inches; 1910-11, 156 lb., rainfall 93·77 inches; 1911-12, 96 lb., rainfall 106·18 inches. The above figures, however, are not strictly representative, since the year's returns refer to the financial year ending on March 31, which does not coincide with the cotton year ending on September 30. There has been a substantial increase during the year under review in the acreage planted in Sea Island cotton, which may be attributed to larger planting by the peasantry. In 1910-11 there were 545 small holders with 916 acres, whereas last season there were 1,570 small holders with 1,865 acres. This rapid increase was due to the successful working of the Government's co-operative buying system at the Central Cotton Ginnery. A summary of work performed at this establishment next receives attention in the report, and the increase in the amount of business done is shown by the following figures: seed-cotton purchased during 1909-10, 93,850 lb.; during 1911-12, it was 510,932 lb.

In contradistinction to the reduction of cotton yields, the output of cacao has shown a decided increase, there having been over 50,000 lb. more exported during 1911 than during 1910. Progress in the minor industries is not as satisfactory as might be desired.

The report of the Agricultural Superintendent concludes with details of administration and meteorological returns of considerable local interest.

At the end of the publication will be found a report indicating satisfactory progress at the Agricultural School, together with the report of the Government Veterinary Surgeon, which presents the gratifying information that only two deaths from anthrax among stock are recorded in the period to which the information relates, and it may be added that no occurrence of anthrax has been observed in St. Vincent since July 1911.

Lime Cultivation in St. Lucia.— Information embodying the following facts has recently been received from the Agricultural Superintendent, St. Lucia:—

It is pointed out that lime planting on a commercial scale was begun in St. Lucia during 1901. At the beginning of 1913 it was estimated that the area devoted to the industry was approximately 2,000 acres. At present there are indications that the area will rapidly increase, now that it has been shown that conditions of soil and climate suitable for the successful development of productive lime estates exist on a fairly large scale in St. Lucia, and consequently, the island promises to become in the near future an important centre of the lime industry.

The distribution, at nominal charges, of large quantities of lime plants from the nurseries of the Agricultural Department, has contributed very considerably to the substantial progress that has been made. As many as 326,067 plants have been sent out during the period 1901-12 inclusive. This number is sufficient to plant 1,630 acres, on the basis of 200 to the acre.

Lime products are now beginning to figure to an appreciable extent in the exports of the Colony, the value of these for the period April 1912 to January 1913 inclusive being estimated at £1,216 11*s.* 3*d.* Steam concentrating plants have recently been installed on several estates and are giving very satisfactory results.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

In the editorial article of this number an attempt is made to bring forward some of the advantages that accrue from, and measures that lead to, uniform production in cotton growing. The opinion is expressed that extended organization in this direction should render closer the relationship between producer, manufacturer and consumer.

Under the heading Veterinary Notes, on page 149, will be found information on worm diseases in estate animals.

On page 151 is presented a review of the report of the Agricultural Department, St. Vincent, for 1911-12.

A short account of suggestive results in regard to a new breed of cattle for the Tropics will be found on page 152. The subject receives further attention under Students' Corner, on page 157.

Under Insects Notes, on page 154, is continued the account of root borers and other grubs in West Indian soils.

The second and final article on subsoil water is presented on page 155.

Fungus Notes, which will be found on page 158, comprise the third and final article on Red Rot Fungus and the Sugar-cane in the West Indies.

A Possible New Breed of Cattle.

The *American Breeders' Magazine*, Vol. IV, No. 1, contains an article which describes the results obtained by crossing the Zebu and Hereford breeds of cattle. The breeding tests, although of a preliminary nature, have been carried out along Mendelian lines and it has been found that the peculiar horns, dew lap and sheath, drooping ears, large hump and colour of the Zebu are probably unit characters. It is believed that some of the size and bulk characters blend permanently and that a mixed hybrid might be created that would breed very closely true to some new type which would combine the tick, insect and tropical disease-resistant character of *Bos indicus* (Zebu) with some of the desirable beef or milk characters of *Bos taurus* (European breeds). Complete segregation occurred in the second generation. That is, Hereford animals were bred from crossing hybrids of the first generation. An experiment is now in progress to see if these apparently pure Herefords have taken up a factor from the Zebu (from which they partly originated) that will render them resistant to disease and ticks, without interfering with the excellent beef characters for which the Hereford breed is renowned.

The subject has been considered sufficiently suggestive and important to warrant further reference under Students' Corner, on page 157, where illustrations will be found of the types of animals bred from.

The Presence of Formaldehyde in the Sap of Green Plants.

The most generally accepted theory as to the way in which sugar is built up in plants is that the whole of the carbon and half of the oxygen in a molecule of assimilated gaseous carbon dioxide combines with the hydrogen in a molecule of water absorbed by the roots. The remaining molecule of oxygen is exhaled during the course of the process, and the compound produced by this combination is considered to be formaldehyde —the active constituent of the well-known disinfectant, formalin. Until recently however, formaldehyde has never been demonstrated in the sap of green plants with certainty. In the *Journal of the Chemical Society* for March 1913, it is stated that a very sensitive and a specific test for the compound has been discovered in the form of atractylin. The leaf sap and its distillate of eleven species of green plants tested in this way showed the presence of formaldehyde, whilst the same products from six species previously kept for twenty-four hours in the dark gave no reaction. Three non-chlorophyllic parasitic plants were also tested, and formaldehyde was found to be absent. The results are therefore in complete agreement with the usual theory of photosynthesis (building up of sugar by means of light). It is unnecessary to add that the final production of sugar from the formaldehyde is a matter of great simplicity compared with the production of formaldehyde in the first instance.

Floral Abnormalities in Maize.

Some interesting results on this subject are recorded in *Bulletin* No. 278 of the Bureau of Plant Industry, United States Department of Agriculture, where it is stated that flowers possessing ovaries and stamens always had the normal number, three, if the stamens were fertile. Flowers having both ovaries and sterile stamens often had less than three stamens. Fertile and sterile stamens were never found in the same flower. The occurrence of a larger percentage of 2-flowered spikelets near the tip of the female inflorescence may be taken to indicate that the tip of the ear is less highly specialized than the remainder of the ear. The development of 2-flowered female spikelets is looked upon as a reversion to a more primitive type, the tendency of evolution being towards more complicated types with more highly specialized parts.

For further information on abnormalities and hereditary characters in maize flowers, reference may be made to the editorial in the last issue of this journal, and to page 121 in No. 286 of the current volume.

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Distribution of Temperature in Plants.

Very considerable variation occurs between the temperatures of different species of plants growing under similar conditions. The temperature, for example, inside a fleshy leaf of the prickly pear (*Optunia* sp.) at midday, may often be as high as 100° F., whereas the interior of a cabbage at the same time may be as low as 75° F. Frequently inside the so-called stem of the banana the temperature may be 75° F. in the early morning, this being occasionally higher than the temperature of the atmosphere.

The existence of differences in the same plant is not so easily demonstrated, but the matter has recently received some attention, and an abstract in the *Experiment Station Record* for February 1913, contains the results that have so far been obtained. The observations were made with a specially devised electrical apparatus. It was found that in general the temperature increases rapidly in the stem as the distance from the ground is increased until a point of equilibrium is arrived at, above which the temperature again becomes greater as one proceeds towards the plant's extremities. In the leaves, the temperature decreases, beginning with the petiole, and attains a minimum at its juncture with the blade of the leaf, again increasing rapidly in the veinlets in the case of palmately-veined leaves, or more slowly in pinnate venation. In buds the temperature is generally higher than in other parts of the plant. Under the influence of intense sunlight the differences noted above are more or less reversed, and the highest temperatures occur in those portions of the plant which are most thickened. Light, in fact, has a cooling effect since it stimulates stomatic transpiration. The cause of the differences in temperature just noted is believed to be mainly connected with the circulation of the sap and with chemical changes within the plant tissues.

The International Rubber Exhibition, 1914.

The supplement to the *Rubber World* for March 27, 1913, presents further information on the forthcoming exhibition in London, concerning which a note has already appeared in the *Agricultural News*, Vol. XII, p. 124.

A list is given in this supplement of the honorary advisory committee composed of some three hundred residents in different parts of the world directly in touch with the cultivation and manufacture of rubber; and emphasis is laid upon the inclusion of fibres and tropical products generally in the exhibition—a development that will widen the scope of the exhibition and render it generally interesting and instructive. The benefits that are likely to accrue from the interchange of information and ideas between agriculturists, manufacturers and consumers cannot be over-estimated since synchronically with the exhibition will be held the Fourth International Rubber and Allied Trades Conference as well as a Conference of members of the International Association of Tropical Agriculture.

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The Production of Otto of Roses.

The present high price of otto of roses consequent on the recent disturbances in the Balkan States makes the idea worth consideration that a small industry might be started in the West Indies. The sale of perfumes in the West Indian islands is much greater than is generally imagined and the main constituent in the various concoctions sold is the essential oil of the rose. Vanilla essence, jasmine, cassie, orange and cedar are also common ingredients. According to the *Chemist and Druggist* (Vols. XXVII and XXIX) the Thracian rose is the variety chiefly cultivated in Bulgaria. The essential oil occurs mainly in the ovaries and stamens rather than in the petals of the flowers.

Eight thousand trees are planted to the acre and it takes about 220 fresh flowers to make a pound of blossoms. It is customary to grow vegetables in between the rows of trees. According to Gildermeister and Hoffmann, *Rosa damascena* is the chief variety and is probably the same as the Thracian rose. It takes about 5,000 lb. of roses to yield 1 lb. of essential oil. It might be interesting if a few small-scale experimental distillations were made with roses grown in the West Indies The so-called Cann rose appears to be one suitable variety for the purpose. In France, *R. centifolia* is grown for the production of dried petals and rose water.

It is obvious that the fundamental question is whether flowers sufficiently rich in perfume could be grown. As regards distillation and the distribution of the produce, a central still seems to commend itself, though in many parts of Bulgaria each peasant distils his own oil by means of a small copper still of extremely simple construction.

INSECT NOTES

ROOT BORERS AND OTHER GRUBS IN WEST INDIAN SOILS.

The article on this subject in the last issue of the *Agricultural News* provided useful information regarding the occurrence of, and damage inflicted by, the different species of hard back beetles in Barbados and St. Kitts. The following notes continue the subject in regard to the species in Antigua, Porto Rico and St. Vincent, and contain important information on the habits of the common hard back.

The brown hard back in Antigua (*Lachnosterna* sp.).

In Antigua, grubs of hard back beetles have for several years past been suspected of causing injury to sugar-cane, and in December and January (1911-12) serious damage was done to a field of onions. In the latter instance the roots and bulbs of the growing onions were eaten to such an extent as to cause the loss of practically the whole crop on a field of 7 acres.

In the case of the attacks on sugar-cane, the cuttings used for planting were often injured sufficiently to prevent the growth of the shoots, thus necessitating a considerable amount of replanting or supplying.

In the older canes, these grubs are suspected of being root trimmers and causing damage by destroying the fibrous roots.

Recently (February 1913) the Superintendent of Agriculture for the Leeward Islands has reported an attack of this kind on Indian corn, in Antigua. In this instance the corn was beginning to ripen its grain, and the injury to the roots resulted in an appearance of the plants similar to that observed in plants dying of drought. Examination revealed the fact that many of the larger roots were denuded of the finer laterals. Injury of this sort may have been partly responsible for the conditions of Indian corn suffering from root disease, at times in Antigua, before the presence of the grubs was associated with the unfavourable condition of Indian corn, but in this instance no root disease symptoms could be discovered on examining the roots.

The adult of this grub is a brown hard back somewhat smaller than *Phytalus smithi*, and considerably larger than *Lachnosterna patruelis*. Specimens were sent for identification to Mr. Guy A. K. Marshall of the Imperial Bureau of Entomology, who states that it is *Lachnosterna* sp. and that there are no specimens of it in the British Museum.

The May beetle or 'Caculo', in Porto Rico (*Lachnosterna* sp). References: Annual Reports, Porto Rico Experiment Station; Second Annual Report of the Sugar Producers' Association of Porto Rico, 1911-12.

This is another brown hard back, larger in size than any of those already discussed. The following quotation is taken from the report by Mr. D. L. Van Dine, Entomologist of the Sugar Producers' Association, included in the Second Annual Report (see reference above).

'The "May beetle", *Lachnosterna* sp.

'The injury to the roots of the sugar-cane by the white grub of the May beetle is the most acute insect problem before the Porto Rican cane planters. Mr. E. A. Schwartz of the Bureau of Entomology at Washington pronounces the species to be closely allied to *L. neglecta*, Burm. Two further species of the sub family Melolonthides have been collected from the cane fields, one of which breeds at the roots of cane and the distribution agrees practically with that of the common Lachnosterna, though it occurs in comparatively very small numbers. At least three species of the related sub-family Dyanstides have been collected also, and in a certain district one of these, a large Rhinoceros beetle outranks the common "May beetle" in numbers and in the injury to the cane.'

The white grub in Porto Rico is a root trimmer, and so serious were the injuries resulting from its attacks that the Sugar Producers' Association maintained one of its Assistant Entomologists in the United States for a considerable time employed in searching for a parasite or parasites which might exercise a satisfactory control over it in Porto Rico.

The white grub attacks the roots of orange trees and of several grasses, as well as of sugar-cane. Often as many as fifty grubs have been taken from soil around the base of young orange trees. They sometimes cause the death of the tree. The adult beetle is a leaf feeder.

Lachnosterna patens in St. Vincent. Reference: *Agricultural News*, Vol. XI, p. 346.

This hard back beetle is considerably larger than any of those already mentioned. Only the adult form is known. In this stage of its life it feeds on the leaves of cacao and other plants.

DYNASTIDAE.

The insects included in this group are mostly scavengers in their mode of feeding in the larval condition; that is to say, the grubs of the Dynastid beetles generally feed on dead and decaying vegetable matter.

It is known, however, that they sometimes depart from this habit and become active enemies of growing plants. Examples of this are found in the West Indies, and several species, in which this change of habit is known to have occurred, are referred to below.

The common hard back (*Ligyrus tumulosus*). References: *West Indian Bulletin*, Vol. VI, p. 37; *Agricultural News*, Vols. VII, p. 218, and IX, p. 186

This is the most widely distributed in the West Indies and probably the most generally known of all the beetles in these islands.

It is the dark-brown or black hard back which occurs in all the islands of the Lesser Antilles and is the one that is attracted to lights in houses, and comes buzzing and bumping around the lamps, falling with a thud to the floor or table, and then after a short pause frantically starting off again.

The larvae live in decaying vegetable matter such as megass, dead leaves, and pen manure. They probably do not attack plant tissues, that is, it is unlikely that they feed on roots, under ordinary circumstances at least, although they are often found in the soil in which plants are growing.

It is only recently that the difference between the larva of this insect and that of the brown hard back (*Phytalus smithi*) has been recognized in Barbados, and it seems likely that confusion may exist in each island as to the distinctions between harmless grubs in the soil and those which injure plants by feeding upon their roots and portions of the underground stem. These two kinds of grubs are similar in their general appearance. The grubs of all hard backs are whitish in colour and are possessed of three pairs of slender legs, which are attached to the thoracic segments—the anterior portion of the body just behind the head. The presence of these three pairs of legs is the chief characteristic which distinguishes the hard back grubs from the root borer or weevil larvae, as these latter are always without legs.

A related species, *Ligyrus rugiceps*, is known as the sugar cane beetle in the southern United States. It is in the adult condition that this insect is injurious, for it is the adult which eats out cavities in the underground stem portions of the cane. A related insect of similar habit has been received recently from Barbuda. This is *Dycinatus barbatus*, a smooth, shiny-black beetle about the size of *L. tumulosus*, which is known to occur in Antigua, Barbuda and St. Kitts.

The principal natural enemy of the common hard back is one of the burrowing wasps of the family Scoliidae, *Dielis dorsalta*, which occurs in Barbados, and in other islands. This wasp is related to the parasite of the brown hard back (*Phytalus smithi*) and that of the fiddler beetle (*Elis atrata*), which have already been mentioned.

Dielis dorsata is an insect which exhibits marked colour differences in the two sexes, the dorsal surface of the abdomen of the female bearing large patches of a reddish colour, whilst the male shows a bright golden yellow in the same positions.

The banana root grub of Dominica and St. Lucia (*Tomarus bituberculatus*). References: *Agricultural News*, Vol. II, p. 264; *Insect Pests of the Lesser Antilles*

The adult of this species is a moderately large beetle of the hard back type, measuring about 1 inch in length and $\frac{5}{8}$-inch in width. The grub is probably normally a scavenger in its feeding habits, but on several occasions it has been the cause of serious injury to bananas, especially newly planted suckers, by destroying young roots and tunnelling into the soft base of the sucker. In a few instances the adult beetle has been found tunnelling into the base of the banana plant itself. Plantains, tannias, yams, and the roots of young cacao plants are also attacked.

In the next issue of the *Agricultural News* the subject will be continued with regard to the Rhinoceros beetles and other species of the sub-family Dynastidae that are known to inflict damage upon cultivated plants in the Lesser Antilles. An interesting and important account will also be given concerning the natural enemies of these grubs.

SUBSOIL WATER.

II.

In Part I of this article by Mr. H. A. Tempany, B.Sc., which appeared in the last issue of the *Agricultural News*, considerations of a general nature were dealt with in regard to the existence and movements of underground or subsoil water; in the following account will be considered some aspects of the question having special reference to West Indian conditions.

Each island in the West Indies constitutes an entirely separate and distinct subsoil water system in which the reserve of contained moisture is continuously finding its way to the sea. The majority of the islands are wholly or partially volcanic in origin, and in those of smaller size, at any rate, the conditions most usually met with consist of a central peak or mountain range rising to a height of from two to four thousand feet above sea-level, and possessing numerous minor lateral spurs and escarpements sloping down more or less evenly to sea-level at the coast. The central portions of these mountain ranges are usually composed of compact impervious volcanic rock, whilst the mountain slopes and valley bottoms are generally covered to a considerable depth with volcanic detritus and alluvium of a character more or less permeable.

Under conditions such as these, the rainfall is naturally greatest in the more mountainous central region, and diminishes as the coast is approached; the cultivated lands, on the other hand, are in most cases confined to the comparatively level tracts of the coastal region, the mountainous centre being left largely in a state of nature

In the case of certain islands, notably Trinidad, Barbados, Antigua, Barbuda and St. Croix, a somewhat different state is presented, volcanic formations being there replaced wholly or in part by more or less permeable sedimentary strata, the well-marked central mountainous region giving place, to a considerable extent, to undulating ranges of hills of lower elevation.

In all cases, however, each island constitutes a system in which subsoil water continually drifts down to the sea from the central region, the general character and rate of the flow being governed by local physical conditions in each case, but being naturally least during dry periods.

In general, the steeper the slopes the more rapid will be the seepage flow. In those islands possessing central mountain chains the movement of subsoil water will show very marked features. In districts such as these it is usual to find an abundance of rivers and watercourses which owe any permanent flow that they possess during drier periods to seepage of subsoil water along definite channels throughout their length. In rainy weather they serve to carry off the surface or storm water.

The conditions prevailing in the central mountain region will very considerably affect the character of the seepage flow at lower levels. Thus, a heavy clothing of forest on the mountain sides will have a marked effect in this direction.

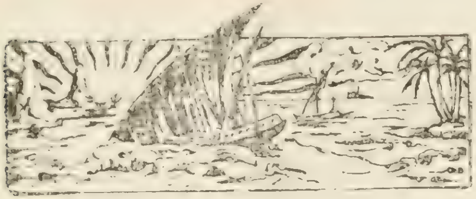
The powers of forest to modify the effect of rainfall are well known; a large proportion of the rain which falls in forest clad region, is held up in the water-retaining surface layers, whereas if the land surface had been denuded of trees, this would have run off as storm water.

The moisture held up in this way becomes subsequently available for maintaining the supply of subsoil water; and when an adequate forest growth clothes the sides of the central mountain region in West Indian islands, it must go far to ensure a regular and even supply of subsoil water from the upper to the lower levels.

In the absence of such a forest clothing, a far larger proportion of the rain which falls will pass off as storm water, and in consequence the supply of moisture available to maintain the flow of subsoil water in the dry months will be greatly lessened. As a result, the lower cultivated lands may, under these conditions, be subject to very considerable fluctuations in the level of the water-table, and this may adversely affect crops growing thereon.

The effect of fluctuations of this description will tend to be most marked in cases where the cultivated lands slope evenly up from the sea to the bases of the mountains and are underlain by subsoils composed of volcanic detritus which attain a considerable depth. Under these conditions, the subsoil flow will be rapid in rainy weather, but when dry weather supervenes the level of the subsoil water table may drop below the reach of the growing plants.

On the other hand, the effect will tend to be less marked in the case of the broad alluvial valleys and plains rising very gently from the sea-level and enclosed by high hills, such as constitute an important part of the cultivated lands of some islands. Here the seepage flow will be slower as the height above the sea is less, and the risk of the complete cutting off of supplies of underground water during drought will be minimized. This constitutes one of the reasons why bottom levels are often preferred for purposes of cultivation, especially in dry localities.



GLEANINGS.

It is stated in the Antigua *Sun*, (April 5, 1913) that at the last meeting of the Antigua Horticultural Society, held on March 26, the rules already drafted were confirmed. At present the society is composed of over 100 members. The President of the society is the Bishop of Antigua.

The value of the tulip tree (*Thespesia populnea*) as a green dressing has recently been investigated in Ceylon. It is considered that this plant ought to be more widely employed as a green manure for tobacco. The composition of the ash shows that it is rich in lime and potash, the latter constituent being largely required for successful tobacco growing. (From *Tropical Life*, for February 1913.)

It is stated in the St. Croix *Avis* that the Agricultural Society proposes to hold an agricultural and industrial exhibition in January next, and in order that the public may have time to prepare to compete for the prizes which will be offered, an account is given in the paper of the lists of awards. The society hopes for some help from the Government and expects to be able to distribute at least $500 in prizes.

The *Annales de L'Institut National Agronomique* contains a paper describing an investigation of the different ways in which phosphorus and calcium occur in milk casein. It is concluded that phosphoric acid and calcium occur in the form of calcium combined with the acid, probably the tri-calcic phosphate, and as phosphoric acid itself, held by the protein and susceptible of being displaced by hydrolosis or saponification.

In West Indian educational circles it may be of interest to learn that a recent invention has been made in regard to rubber bladders for footballs. It is well known that the India rubber bladder of the usual leather case football has the disadvantage that it is damaged very easily if sand gets between the rubber and the leather cover. In the *India Rubber Journal* for March 29, 1913, it is stated that bladders are now made covered with a textile for the purpose of strengthening and protecting the upper surface of the bladder. This should also tend to lesson the rapid decomposition of rubber that occurs in the Tropics.

It is stated in *The Board of Trade Journal* for March 27, 1913, that from 20,000 to 22,000 bales of kapok were destroyed by fire at Samarang, on or about March 14, 1913. If the statement is accurate, this quantity, together with about 14,000 bales burnt at Sourabaya some six weeks previously, accounts for 15 per cent. of the entire crop. Prices have consequently risen 2c. per kilog. in India, and 1 to 1½c. per kilog. in Amsterdam.

A circular despatch from the Secretary of State for the Colonies is published in the Barbados *Official Gazette* (April 25, 1913), in which the attention of the Government is directed to the forthcoming International Exhibition which is to be opened at Ghent in April next. One of the most important features as regards the tropics will be the display of exhibits illustrating the nature of, and the efforts of British administration to cope with, the various contagious diseases that are common in hot climates.

A copy of a Plant Protection Ordinance has recently been received from the Director of Agriculture, Nyasaland. This Ordinance prohibits the landing of plants elsewhere than at Port Herald and enforces disinfection. The Ordinance also provides for the control or eradication of insect pests or plant diseases within the Protectorate itself. Any person found guilty of an offence against the Ordinance is liable to a penalty not exceeding £50.

The cultivation of Para rubber has continued to increase in the Straits Settlements, the total area planted with this product being about 135,000 acres. Pine-apples, which have commanded a good price during the past year have been planted largely as a catch crop with Para rubber. The price for coco-nuts in the same country has been generally higher than in the last few years and considerable attention, though not as much as is deserved, is being given to this cultivation. (From *Colonial Reports*—Annual, No. 750, 1911.)

Reference is made in a recent number of the *Australian Sugar Journal* to a new mechanical cane cutter now under trial in Louisiana. About 2 acres of cane land have been set aside for the trial and the machine has made a series of successful short runs The longest continuous run was between 60 and 70 feet. The stoppages were caused by an occasional stalk striking some exposed guide rod or nut of the machine, thus interfering with the even feed of the cane, and also by some difficulty in getting rid of the trash after it had been stripped.

A note in *Nature* (March 6, 1913) refers to the memorial to the late Sir J. D. Hooker, which has been placed at the Parish Church, Kew. The memorial consists of a mural tablet of coloured marble, bearing the following inscription: '1817-1911, Joseph Dalton Hooker, O.M., G.C.S.I., C.B., M.D., D.C.L., LL.D., Associété Etranger of the Institute of France, Knight of the Prussian Order "Pour le Mérite", sometime President of the Royal Society, for twenty years Director of the Royal Botanic Gardens, Kew. Born at Halesworth 30th June 1817, died at Windlesham 10th December 1911. The works of the Lord are great sought out of all them that hath pleasure therein.'

STUDENTS' CORNER.

MAY.

Second Period.

Seasonal Notes.

An examination should be made of those canes that are seen dead or dying in the fields on various estates with the object of ascertaining the cause of death. In connexion with this suggestion read Fungus Notes in this number of the *Agricultural News.* What is the cause of pine-apple disease of the young cane plant? Careful observations should be made to ascertain whether the eggs of the moth borer which are found on the young cane leaves are parasitized. The eggs are laid in batches and the mass turns black, thus rendering it distinctly visible to the naked eye.

As regards young plants that have died, an examination will possibly reveal the presence of the 'root' borer in the portion of the stem underground. Is the 'root' borer ever found in the stem above the level of the soil?

The sugar factories will now be in full operation. Attention should be given to the matter of weighing canes. How may this operation be made to indicate the relative fertility of the different fields and the effects of different manurial treatments? Another important matter is the efficiency of the mills, and in this connexion read the article in the present number of this journal entitled Multiple Mills. See also the article on the value of the upper and lower halves of the sugar-cane in the last issue of the *Agricultural News.*

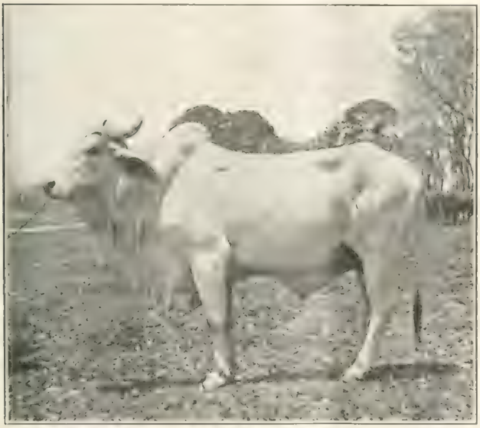


Fig. 4. Zebu Bull.

The attention of the student has frequently been directed of late to the importance of breeding selected cattle having in view one of the following objects at a time: (a) labour capacity, (b) meat-producing capacity, (c) milk-yielding capacity.

Quite recently a suggestive paper on the possibility of producing a new breed of cattle for the Tropics has been published in the *American Breeders' Magazine.* The information is based upon crosses that have been made between the Zebu (see Fig. 4) and the Hereford breeds (see Fig. 5). The results obtained to will be found abstracted on page 152.

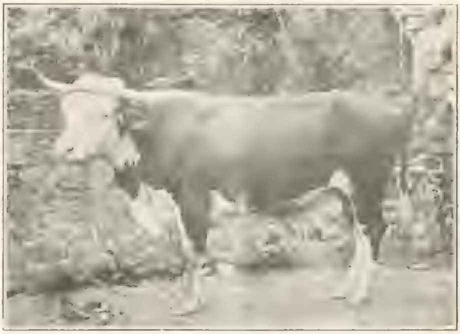


Fig. 5. Hereford Bull.

In the first generation of the crosses, the Hereford characters are dominant, but the hybrid although resembling the animal shown in Fig. 5 is longer in the leg and more active looking. What is most important, these hybrids were found to remain tick-free on tick-infested pastures.

It is expedient that the student should pay great attention to such a matter as this by observing the characters of any crosses that may be found between Zebus and Herefords, and by comparing their points with those of the animals shown in the accompanying photographs.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What do you understand by the term osmosis? Describe the occurrence of this phenomenon in the soil.

(2) What objections are there to the name 'root borer'?

INTERMEDIATE QUESTIONS.

(1) In planting yams, does the size of the set affect development? Can you explain this?

(2) Describe any insect pest of yams.

FINAL QUESTIONS.

(1) What is 'fancy' molasses? Compare its cost of production with that of muscovado sugar and with that of ordinary molasses.

(2) Show by means of line drawings the difference in appearance between *Phytalus smithi* and *Ligyrus tumulosis.*

Important information is presented in the *Quarterly Journal of Experimental Physiology,* Vol. VI, No. 1, in connexion with the recent results that certain organs in the body can produce substances (hormones), some of which are capable of stimulating the secretion of milk. Experiments were conducted to see if the administration of certain of these glandular extracts could increase the yield and quality of milk under the ordinary conditions of farm practice. It was found that although the injections increased collection of milk in the lower portions of the udder, there was no alteration in the total quantity yielded per diem, nor any variation in the quality of the milk.

FUNGUS NOTES.

RED ROT FUNGUS AND THE SUGAR-CANE IN THE WEST INDIES.

PART III.

In the last issue of the *Agricultural News* an account was given of inoculation experiments with the red rot fungus (*Colletotrichum falcatum*) carried out by South and Dunlop in St. Kitts. In the present, and final article on the subject, will be presented the results obtained by these investigators from subsequent experiments in Barbados.

It may be remembered that in the St. Kitts experiments, the different series of inoculations were made on White Transparent, and the fungus appeared not to be an active wound parasite on the growing cane. There was, however, some evidence to show that infected cuttings of this variety might occasionally perpetuate the disease, though the most generally observed effect was a falling off in vigour and appearance of the young shoots growing from the infected cuttings without any definite sign of *C. falcatum* in the shoots. The following work, carried out in Barbados, was designed to investigate the behaviour of the fungus in infected cuttings in a more complete manner.

EXPERIMENTS IN BARBADOS.

Four lots of forty cuttings were obtained from healthy plants belonging, respectively, to the following varieties: B.147, B.376, Bourbon and White Transparent. About half of each lot were top cuttings, the remainder being stem cuttings, later referred to as 'bottoms'. Before treatment, the forty cuttings of each series were paired as regards size to ensure the control plants being strictly comparable. Treatment consisted first in a thorough washing to remove mealy-bugs and dirt; the planting material was then sterilized for five minutes in corrosive sublimate (1 in 1,000), dried in the sun, and finally the ends were tarred, with the object of preventing subsequent infection in the soil. Twenty cuttings of each variety were then inoculated in the mycological laboratory of the Imperial Department of Agriculture, the methods employed being the same as those used in the case of series A in the St. Kitts experiments, except that mycelium was used from a culture four days old and sterile wet cotton wool was bound over the needle wounds. Before planting out, notes were made as to the size of each cutting, and any which were found to be slightly split in the exposed tissue at each end were retarred. The cuttings were planted horizontally in thoroughly moist well-tilled garden soil adjoining the laboratory

In carrying out the experiments comparative observations were recorded with a view to obtaining information on the following points:—

(1) External and internal changes in the inoculated and controls before the appearance of the shoots above the ground.

(2) Effect of the fungus, and of 'tops' and 'bottoms' and size of cuttings on rate of germination (i.e. the first appearance of the shoots above the ground).

(3) Extent of infection after germination.

(4) Effect of inoculation on the development of the young canes, particularly as regards whether the fungus can spread from stool to shoot.

It will be convenient to present the results in the order of the above arrangement.

RESULTS.

One week after planting there were dug two pairs of cuttings of each one of the four varieties. Light showers had fallen during the week and the soil was in a good damp condition, having a midday temperature of 100°F. at a depth of 3 inches.

As regards external characters, there was very little variation to be seen between the different sets of material planted. The cutting was generally swollen with the central bud more developed than the remaining two at either end. The root system had developed from the underneath surface only, the roots being about $\frac{1}{2}$-inch in length and more or less confined to the two lower nodes.

On removing the tape the controls of all four varieties showed either no discoloration, or else a slight blackening around the puncture; but in the inoculated canes there was a streak in the rind about $\frac{1}{4}$-inch wide by $\frac{1}{2}$- to $\frac{3}{4}$-inch long of a red or reddish-brown colour, sometimes accompanied by shrinkage and wrinkling.

On splitting open the cuttings in the plane of the needle wound a brick red discoloration was found extending, in the case of one of the inoculated Bourbon cuttings, through the entire internode; in most of the inoculated cuttings of the other varieties the discoloration was less, measuring about $1\frac{1}{4}$ by $\frac{3}{16}$-inch. Cultures were made from all these discoloured tissues and *C. falcatum* was obtained in every case, thus providing conclusive evidence of successful inoculation. In the controls (and in the inoculated cuttings too) there was some grey and red discoloration in the top and bottom internodes, although partly the effect of tar absorption, bacteria were isolated from the red tissue and a pink Fusarium from the grey. Tarring is therefore not sufficient to prevent infection at the cut ends, though it is probably the splitting that enables bacteria and fungus saprophytes to enter.

Turning to the second series of observations on the rate of germination, it will be convenient to consider first any differences between the controls and inoculated cuttings. Stated shortly, it was found that in the Bourbon series of shoots, six controls came through before the corresponding inoculated; in the case of B.376, four inoculated came through before the corresponding controls; in White Transparent two inoculated came above the ground before the controls to these; and in B.147, one inoculated appeared before its control. The remainder either appeared at the same time or did not germinate at all. As regards total germination up to six weeks after planting, the following are the numbers of shoots that appeared: B.147, ten control shoots, ten inoculated shoots; B.376, twenty-four controls, twenty-four inoculated; White Transparent, twenty-four controls, twenty-five inoculated; Bourbon, twenty controls, seventeen inoculated.

The above figures point to the inability of the fungus to check germination except in the case of the Bourbon cane.

In connexion with the effect of 'top' and 'bottom' and size of cutting upon germination, the following observations were made. The pairs of very small cuttings (i.e. the cuttings with three nodes close together) germinated earliest, particularly in the case of B.376, which in general was the variety quickest to germinate; an exception appeared however, in the case of White Transparent, of which the very largest cuttings came up first. In the other three varieties, the small stem cuttings germinated before the large top cuttings.

The next point to be considered is the extent of infection after germination.

Two pairs of cuttings in each series were dug six weeks after planting. During the previous month the weather had been rather dry with a few slight showers. The soil was fairly moist. No great difference was observed between the inoculated and controls, except that the developing buds of the inoculated cuttings were rather longer than those of the controls, namely, the inoculated shoots measured from 1 to 7 inches long, whereas the shoots of the controls were from ½-inch to 5 inches long. There were occasionally roots near the buds in the inoculated. There was practically no bud development in B.147, though there were as many roots (each about ¾-inch long) arising chiefly from the end nodes, as in the cuttings of the other varieties.

On removing the tapes, the rind was seen to be discoloured purple, in the case of the inoculated plants, about 1¾ by ½-inch around the wound In the case of the Bourbon inoculated cuttings the discoloured area was accompanied by much shrinkage and wrinkling

On splitting open the cuttings, a red discoloration was seen to extend about 2 by ½-inch around the wounds in the inoculated plants. The infection appeared to be spreading only very slowly, and there was no definite sign of the penetration of the fungus into the bud. The controls showed no discoloration around the wounds. There was, however, some secondary infection, in both inoculated and controls, through the tarred ends which had somewhat split. Cultures were made to determine (a) if *C. falcatum* was present in the wound discoloration; (b) the cause of the discoloration in the end internodes of the controls; (c) whether in one case the fungus in an inoculated cutting had spread into the next internode. The result of (a) was that *C. falcatum* was isolated in every instance; in (b) bacteria but no fungi were isolated; in (c) a green Aspergillus fungus was isolated.

There was sufficient evidence, therefore, to prove the inoculations to have been successful.

The final series of observations concerned the effect of the fungus on the development of the growing canes. In the first place it may be stated again that B.376 was the quickest to germinate, the slowest was B.147, and White Transparent, although somewhat late to appear, produced eventually the strongest growth of shoots. At the end of three months after planting, an examination of the shoots gave the following results: The number of shoots withered or dead was, for the controls and inoculated, respectively, 1 and 1 for B.147; 1 and 4 for B.376; 3 and 8 for Bourbon; 2 and 2 for White Transparent. Except in the case of the Bourbon; the inoculated plants looked no worse than the controls; indeed, in many instances, the inoculated plants appeared decidedly more vigorous.

An examination of the affected cuttings showed similar symptoms to those described in the St. Kitts experiments. There was a red discoloration throughout, though in most cases the tissue of the cutting was rotten. In several instances a rotting of the growing point had taken place, but although fifteen cultures were made from different diseased growing tips, it was not possible in a single case to obtain a growth of *C. falcatum*. The green Aspergillus and the pink and yellow Fusarium already referred to were isolated, however, in some cases, as were also a Cephalosporium form and bacteria. Apparently (but not necessarily) these organisms are saprophytic.

The point of greatest significance in the inoculated plants was the fact that the healthy shoots had completely severed their connexion with the cutting by the formation of a woody partition at the junction of the bud and cutting; these shoots had developed their own root systems, those roots which had first arisen on the cutting being dead. These features of growth were also observed earlier in the experiments. Although the same change was found to have occurred in the controls, it was by no means so pronounced; indeed, in some of the controls there appeared to be very little thickening at the base of the young shoots, whereas in many of the inoculated plants the woody tissue was ¼-inch thick and was bordered on the internal margin by softer red tissue. This internal reddening was not often observed in the controls.

GENERAL CONCLUSIONS.

Taking all circumstances into consideration, it seems that the present position in regard to the parasitology of *C. falcatum* in the West Indies may be summed up as follows: —

(1) The fungus is a facultative wound parasite, of which the degree of virulence varies greatly according to climatic conditions, age, and particularly with the variety of cane. Its chief harm is in consequence of its invert action on cane-sugar, thereby tending to increase the glucose ratio in the factory, though, under certain exceptional conditions, its harmfulness may be felt through a reduction in the yield of cane per acre.

(2) The chief mode of infection seems to be through the agency of boring insects, or through wounds caused by other means; though the St. Kitts experiments have not definitely settled this point. (See Parts I and II, *Agricultural News*, Vol. XII, Nos. 286 and 287.)

(3) In these experiments, the disease was not communicated by infected cuttings. The presence of the fungus in cuttings from mature canes seems to stimulate shoot development and the growth of roots at the base of the shoots, apparently in order that the new plant may cut itself off from the source of infection. In younger cuttings of White Transparent, and in all cuttings from Bourbon canes, the fungus appears to retard development, the buds, in these cases, seeming to lack that vigour which is characteristic of B.376 and the cuttings from mature White Transparent. In the St. Kitts experiments where the fungus appeared to retard development, the planted cuttings were from younger canes and were smaller in size.

(4) The chief danger in planting infected cuttings would appear to lie in the fact that the soil becomes infected, thereby increasing the chance of the disease being communicated by boring insects that come in contact with the soil.

(5) The behaviour of *C. falcatum* in the West Indies is different to that of the organism in the Eastern Tropics.

Agricultural Education in St. Lucia.—A copy of the report of the Agricultural Superintendent, St. Lucia, on the teaching of agriculture in the primary schools of that Colony during 1912, has recently been received at this office. During the year under review it is reported that the examinations were undertaken by the Agricultural Superintendent. They were entirely oral, and the number of candidates presented was on the average of twenty-one per school. The results of the examination show that on the whole there has been improvement, the marks obtained being in the aggregate nearly 7 per cent. in advance of those of previous years. The suggestion made in earlier reports to the use of garden note books has with one exception been generally adopted with excellent results. The plants under cultivation in the school gardens have included native and European vegetables and also some cotton, cacao, canes and bananas. Budding work has been conducted on mango and orange seedlings. On the whole the condition of the gardens in the primary schools appears to be extremely good.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, April 22, 1913; Messrs. E. A. de PASS & Co., April 11, 1913.

ARROWROOT—3⅞*d.* to 5*d.*
BALATA—Sheet, 2/10; block, 2/- per lb.
BEESWAX—£7 15*s.* to £7 17*s.* 6*d.*
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COFFEE—Jamaica, 65/- to 80/-.
COPRA—West Indian, £29 10*s.* per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 17*d.* to 22½*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Quiet. 42/- to 62/-.
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New York.—Messrs. GILLESPIE BROS. & Co., April 18, 1913.

CACAO—Caracas, 14c. to 15c.; Grenada, 14c. to 14¼c; Trinidad, 14¼c. to 14½c; Jamaica, 11¾c. to 13¾c.
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Trinidad.—Messrs. GORDON, GRANT & Co., April 28, 1913.

CACAO—Venezuelan, $15·25 per fanega; Trinidad, $14·40 to $14·60 per fanega.
COCO-NUT OIL—$1·11 per Imperial gallon.
COFFEE—Venezuelan, 16c. per lb.
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DHAL—$4·25.
ONIONS—$2·50 to $4·00 per 100 lb.
PEAS, SPLIT—$6·25 per bag.
POTATOES—English, $1·40 to $1·80 per 100 lb.
RICE—Yellow, $5·50; White, $5·75 to $6·00 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. JAMES A. LYNCH & Co., Ltd., May 3, 1913; Messrs. T. S. GARRAWAY & Co., May 5, 21.

ARROWROOT—$4·75 to $7·50 per 100 lb.
CACAO—$13·50 to $14·00 per 100 lb.
COCO-NUTS—$16·00
HAY—$1·50 per 100 lb.
MANURES—Nitrate of soda, none; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $85·00 per ton.
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ONIONS—$1·25 to $2·36 per 100 lb.
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RICE—Ballam, $5·15 to $5·30 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, $4·00 per 100 lb.

British Guiana.—Messrs. WIETING & RICHTER, April 26, 1913; Messrs. SANDBACH, PARKER & Co., April 25, 1913.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	8c. per lb.	—
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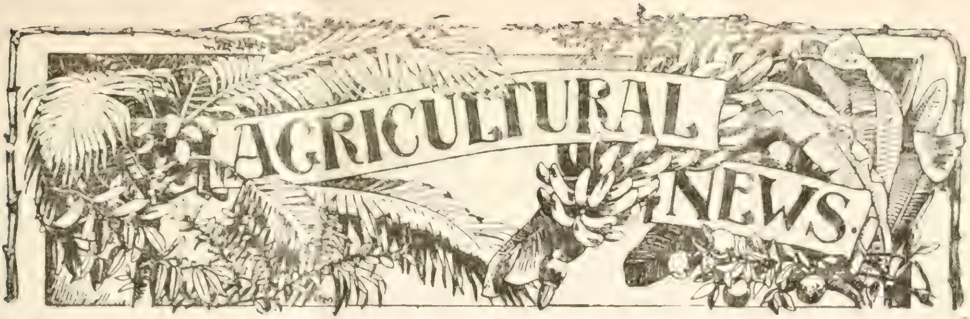

A FORTNIGHTLY REVIEW
OF THE
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Some Aspects of Rainfall

A PATHETIC admission of human dependence upon natural forces is found in the avidity with which use is made, as a source of casual conversation, of the apparently incontrollable factor whose vicissitudes will often occasion the gravest concern and disappointment. The fact cannot be avoided that the subject of rainfall excites sympathetic interest. It might, however, do more. There are many aspects of the subject which are directly related to the business activities of everyday life; there are many inferences to be drawn from statistical records which might be of practical value; and the different local conditions of precipitation have often characteristics so entirely unique that the subject would seem to be deserving of more critical observation, classification and analysis than are usually accorded it by those whose interests it immediately governs.

It may seem like reiterating a truism to say that rainfall is often the limiting factor in the yield of crops. The statement, however, means more than it says. Accurately speaking, it means that after a certain point is reached in the yield per acre of any crop in any locality, further investment of capital in the form of cultivation or manuring ceases to be profitable. It is obviously important to know exactly what this limitation is, and the first requirement is a large number of well-distributed rainfall records extending back over a sufficient number of years to permit of a reliable average being taken. Conjointly with these records are required seasonal returns of the yields of the different crops, and chemical and physical data showing the proportion of the rainfall that remains in the soil for the uses of the plants, and the proportion of water these plants normally contain. Such data being provided, it is then a mere arithmetical calculation to determine whether or not the normal yield of any particular crop in any one locality is limited or not limited by the average receipt of rain. If it is not, then, other things being equal, there is opportunity for further investment of capital per acre; if the average yield is limited by the rainfall, irrigation, or the planting of specially selected drought-resisting varieties is the line along which the best chance lies of increasing the average yield—though, of course, cultivation in itself reacts favourably on the amount of water retained in the soil—a factor which, as has already been pointed out enters into the fundamental relationship that exists between rainfall and the yield of crops.

In a somewhat narrower aspect the importance of rainfall records is evinced by comparing every season, yield and precipitation on individual estates. During a dry season, or a very wet season, certain lines of expenditure in estate management will be lower than when the weather is normal. Others, of course, will be higher. The systematic observations of the rain received are therefore useful as a check on the apportionment of circulating capital; and although the application in this way is often unknowingly recognized, its acknowledgement as a definite correlation would appear to be by no means general.

There is often some doubt cast upon the reliability of rainfall records—not that the actual observations are inaccurate, but rather the circumstance as to whether rain gauges on large estates are placed in such positions as to ensure a truly representative estate record. On those plantations, for instance, which run down to the seashore, it makes the greatest difference if the recording instrument is placed on or near to the coast, or higher up on the estate. For one thing, the actual rainfall is liable to be much less near the sea; and in the second place, the degree of exposure to wind may mean that the gauge in such a place will receive less water than one in a more sheltered position, even though the precipitation is exactly the same in each case. This point is not a new one. It has been critically considered in investigations to find out whether forest-clad land induces more rainfall than land which is bare, and the question may well be regarded with care in this its more limited aspect.

In the West Indies much of what has been said above is directly applicable, though a consideration of the rainfall in these colonies brings out several points of unique interest frequently absent in large continental tropical countries where conditions are more stereotyped. Alluding, for instance, to the question of the effects of forests on rainfall in the West Indies, the statement has been made that rain clouds which approach more or less flat islands like Antigua or Barbados frequently rise and split, or retire in an erratic manner out to sea. The presumable explanation of this curious phenomenon is that the heated air rising from the land interferes with the natural precipitation of moisture by stimulating vaporization, and by setting up repellent air currents. The inference cannot be resisted that afforestation would actually have the effect of increasing the rainfall under such conditions as these, and the idea would seem to warrant the rapid acceleration of the afforestation movement that has recently been started in many islands.

Another curious feature in the West Indies is the 'Statia' rain of St. Kitts, an island near to which lies, some few miles off, the Dutch isle St. Eustatius—popularly known as 'Statia'. Reliable observers say that at certain times of the year, clouds can be seen extending from the respective peaks in each island across the channel. Eventually they should meet. If they do not meet there will be no rain. If they do, the land around the coast receives the shower which for for some hours the local observer has confidently anticipated.

There are other features of West Indian rainfall—generally quite local ones—which are of very great interest to those they immediately concern. These may be dispensed with here, however, and we may conclude with a few references in regard to artificial water-supply and rainfall.

Common observation shows that there is a pronounced difference in the benefit derived from a sharp shower in the Tropics and prolonged watering or even irrigation. Why natural rainfall should be superior can be explained on general physical grounds, but the explanation does not appear to have been entirely established by experiment. The kinetic force of tropical rains causes more rapid penetration, and also, the shade, and the saturation of the atmosphere check evaporation. Undoubtedly some of the gases carried down by rain exert a useful influence: gases like oxygen, nitrogen, oxides of nitrogen—the latter being common after thunderstorms—and even carbon dioxide may have some useful action on the unavailable food supply in the soil. Also the temperature of the rain may be felt. Considering the large quantity of water that is used in gardens in the West Indies, an experimental investigation of the subject would no doubt be of value, in that it would help to provide ways for reducing the big demand on local supplies that are not always constant enough to stand it.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture is due to depart for England, on duty leave, by the R.M.S. 'Magdalena' on the 28th instant. Dr. Watts will conduct official business in England, and will confer with the Colonial Office on matters pertaining to West Indian agriculture.

SUGAR INDUSTRY

THE SUGAR INDUSTRY IN FORMOSA.

The rapid development of the cane-sugar industry in Formosa practically dates from the conclusion of the Chino-Japanese war in 1895, when the island became a part of the Japanese Empire. The country was not easily subdued. In 1898, however, the last rebellion was suppressed, and during 1900-2 a law was promulgated for the encouragement of sugar cultivation, and a Sugar Bureau was established at Tainan to supervise all matters regarding the island's sugar industry. The work of this institution was aided by the introduction of a special protection and bounty system on the part of the Formosan Government.

Recent developments in Formosa have been described lately in an article entitled The Formosan Sugar Industry, Past and Present, by T. Murakami in the *International Sugar Journal*, for March 1913.

In this it is stated that the earlier work of development consisted mainly in the introduction of new seedling varieties from Java, Hawaii and Mauritius. In course of time, however, many of these varieties being unsuited to the soil and climate of Formosa lost, one by one, their superior characteristics. Indeed, Rose Bamboo is the only variety which, by withstanding the severe tests of ten years has proved to-day to be the ideal cane for Formosa.

The tendency during the earlier years of the past decade for Formosa to extend the intensive cultivation of sugar-cane has induced Japanese capitalists to erect a large number of first-class modern factories, constructed mainly by the large British, German and American houses (e.g. the Mirrlees Watson Co., the Harvey Engineering Co., both of Glasgow; the Honolulu Iron Works of Hawaii; Maschinenfabrik Sangerhausen of Germany; and the Blymyer Iron Works Co, U.S.A.). In these factories yellow sugar for direct consumption is made, and also grey sugar for refining purposes. More recently there have been erected a few factories equipped with a complete plant for making white sugar, either by the carbonatation or sulphitation processes. There are thirty-one of these factories, having a total capacity in twenty-four hours of 22,800 tons of cane, yielding, per season, 5,445,451 piculs of sugar (1 picul=133·33 ℔.). In 1900, according to H. C. Prinsen Geerligs, the country's total output of sugar was approximately 45,000 tons; in 1910, it was 230,000 tons.

The method of sugar manufacture in vogue in Formosa is a combination of Hawaiian and Javanese methods of boiling. In Japan there is a considerable demand for small-grained moist sugar of fine colour, having a certain 'viscosity' produced either by the formation of glucose during the clarifying and boiling stages, or by adding a greater or lesser amount of glucose to the disintegrator. This demand is met by several of the factories in Formosa.

An idea of the progress made in sugar manufacture in one of the largest Formosan factories can be obtained from the following data: sucrose extracted in juice, per cent. sucrose in cane (1908-9 crop) 87·5; (1911-12 crop) 91·2; total lost sucrose per cent. on cane, (1908-9 crop), 3·47; (1911-12 crop) 2·53.

In concluding this account of the sugar industry in Formosa, reference may be made to the country's future prospects, which is summed up as follows by Prinsen Geerligs, in the *World's Cane Sugar Industry*:—

'The construction of more factories is under way, so that if the weather had not been too unfavourable, in the year 1911-12, Formosa would have produced an amount of sugar equal to that required by Japan for supplying her own wants, in addition to her own production of 1,000,000 piculs (60,000 tons).

'It is certain that Formosa will not be satisfied with this success, and will aspire after greater things, and endeavour to export her produce to other countries, either as raw sugar or as sugar refined in Japan.

'We must not lose sight of the fact that the success achieved is greatly due to the Government's powerful patronage, and the preferential treatment accorded to Formosan sugar in Japan.* The industry may, of course, lose all these privileges before long, in which case the present state of affairs may change altogether; but we must not forget how in Europe at the time of the sugar bounties, refined sugar could be exported to foreign countries by the levying of a high surtax and a clever co-operation of sugar refiners and merchants.

'The possibility of a great export trade in Formosan sugar depends on Japanese inland politics, so that we cannot say anything certain about it. We may predict, however, that Formosa will produce after 1912 a quantity of sugar large enough to supply Japan's wants, and for the rest we may leave things to the future.'

DETERMINATION OF SUCROSE IN MOLASSES.

In an article on this subject in the *Louisiana Planter* for March 1, 1913, it is pointed out that the methods of analysis of molasses in general use in Louisiana, require the employment of no excess, or at most, a slight excess of lead in clarification, and in this way often very imperfect clarification is obtained. Frequently an excess is employed of necessity, without means being taken to eliminate the error due to this excess. Deerr's method of eliminating the error by using long polarizing tubes and solutions of high dilution, is impracticable for sugar work in Louisiana, as well as being awkward in any case.

Another way to eliminate the influence of the lead precipitate is by the use of dry lead subacetate clarification, and Tervooren's principle along with this clarification has been used with very satisfactory results. An excess of dry lead is added to the half-normal molasses solution and after filtering, the excess of lead is removed by adding approximately the right amount of dry finely powdered oxalic acid. After filtration, the well decolourized, lead-free liquid is polarized, single and Clerget. It was found that too great an excess of lead should be avoided, as the Clerget result falls slightly after a certain excess has been reached. The maximum decolourization however, is produced by an excess which is too small to affect the Clerget method in this way.

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* A note in *The Board of Trade Journal*, for March 6, 1913, states that information was published in the Formosan *Official Gazette* for August 11, 1912, to the effect that the assistance to be given to planters by the Government will consist of payment for the cost of young canes and fertilizers, money grants in aid of irrigation and drainage works, the loan of sugar manufacturing machinery and implements to suitable manufacturers, and the gift or loan of farming implements to cane-growers.

FRUITS AND FRUIT TREES.

CITRUS FRUIT IN THE PHILIPPINES.

Until recently nothing had been done in the Philippines to stimulate and improve the cultivation of oranges and limes. A movement in this direction, however, has lately been set on foot by the Bureau of Agriculture, and an article in the *Philippine Journal of Science* for December, 1912, contains useful results that accrued from an investigation by the Bureau of Science into the commercial possibilities and chemical composition of a few of the most important citrus varieties grown in that territory.

Describing first, in a general way, the condition of the orange cultivation, it is stated that the trees are often planted too close, and that no attempt is made to prune or otherwise improve them, and the orchards are frequently overgrown with bushes. Plant lice and scale insects in places, occasion much damage, and injury caused by borers, and serious cases of gummosis are also to be found. Nearly every tree observed was a host of *Loranthus philippensis*, a parasitic plant of the mistletoe family.

The chemical investigations on the Philippine orange (*Citrus nobilis*, Lour.) concerned analysis of the orange itself, the juice and the pulp. The average percentage gross composition of the fruit is as follows: peel 23·4; pulp and seeds, 76·6; seeds, 3·0. The average weight of 788 oranges was 138 grammes, and the average number of seeds in each fruit was twenty-two. It is of interest to remember in this connexion that the average weight of an orange of the California Washington Navel type is about 280 grammes, and the peel weighs, on an average, only 24 grammes, being but slightly heavier than that of the much smaller Philippine fruit.

The percentage composition of the juice of the mature Philippine orange is indicated by the following figures: solids, 11·80; sucrose, 7·11; reducing sugars, 3·44; protein, 0·75; ash, 0·48; citric acid, 0·60. The juice of the Washington Navel fruit is composed as follows: solids, 13·9; sucrose, 11·3; reducing sugars, 7·9; citric acid, 0·873.

In order to determine if any special difficulties were to be encountered in the preservation of orange juice, the liquid was stored in bottles, to some of which 5 to 15 per cent. sucrose solution was added, and then sterilized at 80°C.

After about a year the percentage of reducing sugars increased with a corresponding decrease in the sucrose and an increase in acidity. The beverage is somewhat bitter to the taste, but the addition of sugar is stated to make it palatable to all. It is believed that much of the bitterness could have been prevented by adopting methods of pressing that would avoid crushing the seeds and the segment covering.

Another investigation concerned the fermentation of orange juice. Complete fermentation took place in seventy-two hours and the product was found to contain 0·2 per cent of reducing sugar and 5·58 per cent. of alcohol. The flavour was good, but greatly improved on being kept in wood. Pot-still methods were employed.

After another set of experiments on the extraction of orange oil, the question of the manufacture of paper from orange pulp was investigated. The paper produced by the orange fibre possessed special waterproof and semi transparent properties, and although it is rather weak, there is cause for the belief that a special use may be found for this paper.

The final section of the article concerns limes. The following figures showing the composition of the Philippine variety are interesting: one fruit, 44 grammes; peel, 7·36 grammes; pulp, 36·6 grammes; seeds, 1 gram. The juice contained about 7·7 per cent. of citric acid, and the ash of the fruit 65·69 per cent. of potassium carbonate. When pressed by hand, each fruit yields about 7 c c. of juice which, if heated between 60° and 70° in the manner described for the orange juice, keeps well and is much preferred in the Philippines to the imported lime juice, which contains excessive quantities of sulphurous acid.

FEEDING VALUE OF BENGAL BEANS.

The following interesting report, by the Imperial Institute, on a sample of Bengal beans (*Stizolobium aterrimum*) forwarded for examination a few months ago, to that institution from St. Vincent, has lately been received from the Agricultural Superintendent in that Colony:—

The sample consisted of beans of an oval shape, about $\frac{3}{4}$-inch long, $\frac{7}{16}$-inch wide and $\frac{1}{4}$-inch thick. The beans had a brittle, shiny, black testa, and a hard straw-coloured interior. In a number of cases they were slightly soft and discoloured internally, owing to their not being completely dry. The taste was faintly bitter

The beans were plump and free from insect attack, and the sample was generally clean and free from extraneous matter. The results of examination expressed on the material as received, was as follows: Moisture, 13·8 per cent.; crude proteins, 25·8 per cent., consisting of true proteins 22 5 per cent., other nitrogenous substances 3·3 per cent.; fat, 3·5, per cent.; starch, etc., 48·8 per cent.; fibre, 4.9 per cent.; ash 3·2.

The nutrient ratio was 1: 2·2, this being the ratio between the percentage of crude proteins and the sum of the percentages of starch and fat, the latter being first converted into its starch equivalent. The food units were found to be 122·1, (the total obtained by adding the percentage of starch to 2·5 times the sum of the percentages of fat and crude proteins).

The beans contained no alkaloids or cyanogenetic glucosides.

In order to determine their commercial value, the seeds were submitted to a large firm of merchants in London, who valued them at from £5 10*s.* to £7 per ton, c.i.f. United Kingdom ports (February 1913). The firm added that these prices represent the value of the beans as a feeding stuff for animals, as it would hardly be possible to find a market for them in the United Kingdom for human consumption.

There seems to be no doubt that these beans could be safely used as a feeding stuff for cattle, since they are already so employed in Mauritius (see *Bulletin* No. 24 de la Station Agronomique de Maurice, 1910). On account, however, of the high nutrient ratio of the beans, it is considered advisable to dilute them with other feeding stuffs which are not so rich in proteins.

Fruit Growing in the Canary Islands.—An interesting article appears in *The Field*, for March 15, 1913, which describes the decline, during recent years, of fruit growing in Teneriffe and Las Palmas.

The original staple industry in this Colony was the production of cochineal, which was eventually threatened with extinction consequent on the discovery of the aniline dyes. The advent of this calamity necessitated the introduction of new industries, and the inhabitants commenced to cultivate on an extensive scale, bananas, and later, tomatoes and potatoes. For a while the position of the island remained prosperous. Eventually, however, keen competition and excessive cropping induced infertility in the soil, with a consequent deterioration in the grade of produce exported.

It is stated that the quality of the bananas and tomatoes sent, at the present time, from the Canary Islands is distinctly unsatisfactory. As far as bananas are concerned, the consumers in England have no cause for anxiety in view of the ample supply from the West Indies, but the inferiority of the vegetables is not so easily ignored It would appear that there is every need for scientific control of agriculture in the Canary Islands. Besides this, however, there are several serious obstacles to be considered in connexion with the financial side of cultivation in the Canaries: land is expensive in view of keen competition. and grave difficulties are experienced as regards the supply of fresh water. Altogether it would appear that the commercial situation as regards agriculture in Teneriffe and Las Palmas is far from being in a state of permanent prosperity.

Referring to agriculture in Morocco, the *Journal of the Royal Society of Arts* for April 11, 1913, states that the orange gardens around Letuan are said to yield fruit of most delicious flavour, and in spite of years of total neglect thriving fig and olive trees are found in every part of the country. Agriculture, generally, in Morocco, is very primitive.

FATE OF TUBERCLE BACILLI OUTSIDE THE ANIMAL BODY.

A very extensive investigation of the mode of dissemination and outside behaviour of the organism causing tuberculosis in animals comprises *Bulletin* No. 161. of the University of Illinois Agricultural Experiment Station. The author of the paper is Dr. C. F. Briscoe.

In the summary to the *Bulletin* it is stated first, that there are four recognized types of tubercle bacilli; human, bovine, avian, and a type that infects cold-blooded animals. The tubercle bacillus does not form spores, nor does it secrete a soluble toxin, though the fact that poisons are produced is well recognized, since tubercles can be brought on in animals by the injection of dead cultures

The author next proceeds to emphasize the importance of definite knowledge as to the powers of vitality of the organism outside the animal body, namely its capacity for resisting conditions of environment inimical to its existence.

The tubercle bacillus, although it does not form spores, is one of the most resistant species of bacteria; it can, however, be killed in a few minutes to a few hours when exposed to direct sunlight. The time of killing is less at higher altitudes, but it is ten to fifteen times longer in diffused light.

Tuberculosis sputum reduced to dust and inhaled by animals causes tuberculosis, and a much less amount is necessary to produce the disease by inhalation than by ingestion, though infection by ingestion is believed to be more common than is generally supposed.

It is next pointed out that a decrease in the number of cases of tuberculosis can, in many places, be correlated with an improvement of the water-supply. It is reported that tubercle bacilli live for several months to more than a year in water and other material.

As regards the exact time that tubercle bacilli live under certain conditions of environment, it was found that whereas pure cultures of non-spore-bearing organisms and the vegetative cells of spore-bearing germs exposed to direct sunlight in thin smears were killed in half to six minutes, the human, bovine and avian types of tubercle bacilli exposed in the same way were killed in one to four minutes.

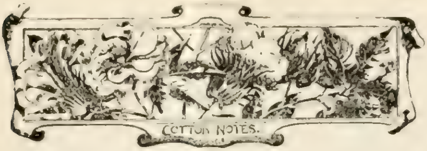
The former group of organisms exposed to desiccation in the dark died in one to four days, spores of *B. subtilis* took thirty-five days; the tubercle bacilli, four to eight days.

Pure cultures of bovine tubercle bacilli mixed in cow manure and exposed in a 2-inch layer in a pasture field in the sunshine remained alive and virulent for two months. Guinea pigs inoculated with germs exposed in manure in the shade developed the disease with greater severity than those animals which were inoculated with germs not protected from the sun.

Tubercle bacilli in the manure of a naturally infected cow, exposed in the same manner as the artificially infected manure, were dead within two weeks after exposure. whilst those bacteria in garden soil and in a dead tuberculosis guinea pig buried in garden soil were alive on the 213th and 71st days, respectively, and dead on the 230th and 99th days, after first exposed.

Tubercle bacilli live for more than a year in running water. A watering trough harbouring these germs may therefore be a dangerous source of infection to cattle.

Another possible source of infection is the bones of tuberculous animals which have been ground and utilized for manurial purposes. The danger from this source would, however, be obviated if the bones were steamed as is frequently done.


COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date May 5, with reference to the sales of West Indian Sea Island cotton:—

Only a small business has taken place in West Indian cotton since our last report; The sales amount to 60 bales, which include St. Kitts and Antigua 19*d.* to 20*d.*, Nevis 18½*d.* to 19*d.* and St. Vincent at 23*d.*

Prices are firm but spinners having fair stocks and poor enquiry for yarn, are not eager buyers.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending May 3, is as follows:—

There have been no receipts or sales reported this week; consequently the market remains unchanged. Although Factors are holding the odd bags of off cotton, of which the stock is largely composed, for one to two cents advance, which has not been paid.

We quote, viz:

Extra Fine	28c. to 29c.	= 16*d.* to 16½*d.*	c.i.f., & 5 per cent.
Fully Fine	26c. to 27c.	= 14¾*d.* to 15¼*d.*	,, ,, ,, ,,
Fine	25c.	= 14¼*d.*	,, ,, ,, ,,
Extra Fine off in preparation	22c.	= 12½*d.*	,, ,, ,, ,,
Fully Fine off in preparation	18c. to 20c.	= 10½*d.* to 11½*d.*	,, ,, ,, ,,
Fine off in preparation	18c.	= 10½*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to May 3, 1913, were 961 bales, 3,166 bales, and 4,408 bales, respectively.

ZAPUPE FIBRE.

Definite enquiries have recently been made at the Office of this Department for information on the newly introduced Zapupe fibre. The following article, containing a general account of the fibre, has been taken from the *Bulletin of the Imperial Institute* for January-March 1913:—

Considerable interest has been taken in recent years in Zapupe fibre, which has been introduced into commerce as a substitute for sisal hemp. As in the case of the latter fibre, Zapupe is obtained from the leaves of certain species of Agave, but the exact botanical source is unknown. The plant occurs wild in the State of Vera Cruz, Mexico, and has been cultivated in the Canton of Tuxpam in that State since about 1901 or 1902. The plant is stated to give better results under varied conditions of soil and climate than sisal, and as it requires little attention in cultivation it seems probable that, once its value is known, its cultivation will be taken up in other countries.

The best situations for the cultivation of Zapupe are gently sloping plains, or the lower slopes of mountains, with a fairly rich soil of not too porous a nature. As the plant is essentially tropical, it will not flourish at high altitudes. It is usually propagated by means of suckers, which are removed from the parent plant when a few inches high, and planted in specially prepared nurseries. After about eight to ten months the plants, now 1 or 2 feet high, are removed to their permanent quarters and set in rows 7 feet apart, with a distance of 5 feet between the plants.

The cutting of the leaves is begun when the plants are four or five years old, and may be continued for a period of about eight or ten years, when the plant produces a large inflorescence, bearing numerous bulbils, which may be used for propagation. An average of about eighty leaves, giving a total yield of about 2½lb. of fibre, is obtained per annum from each plant in three cuttings.

Two samples of Zapupe fibre have been examined recently at the Imperial Institute, with the results given below:—

No. 1. This sample consisted of well-cleaned and well-prepared, lustrous fibre, almost white, and of good strength. The length of staple was irregular, in some cases reaching 4 feet 8 inches.

The fibre was analyzed with the following results, compared with corresponding figures for Mauritius hemp and for sisal hemp from the East Africa Protectorate:—

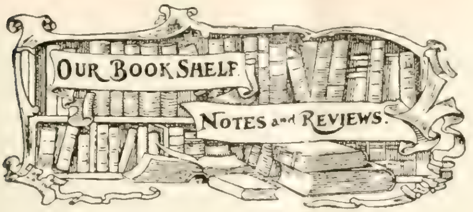
	Zapupe fibre. Per cent.	Mauritius hemp. Per cent.	Sisal hemp. Per cent.
Moisture	11·12	13·0	11·1
Ash	1·2	2·5	1·0
A-Hydrolysis, loss	11·8	7·5	11·2
B-Hydrolysis, loss	15·7	18·3	14·1
Acid purification, loss	2·7	2·0	2·3
Cellulose	77·3	76·4	78·2
Length of ultimate fibres	From 0·05 to 0 14 in. aver. 0 094 in.	From 0·05 to 0·15 in.	From 0·06 to 0·16 in.

It is evident from these figures that the Zapupe fibre approximated very closely to sisal hemp in chemical behaviour and composition, and that it was somewhat superior to the sample of Mauritius hemp, with which it is compared, this superiority being shown particularly by the smaller loss on B-hydrolysis (i.e. boiling for one hour with 1 per cent. caustic alkali).

No. 2. This sample consisted of strong, lustrous, well-cleaned and well-prepared fibre of rather irregular colour, varying from cream to brownish-yellow, and generally darker than sample 1. The length of staple was irregular, up to as much as 4 feet 4 inches. This sample was not submitted to chemical examination.

The specimens were submitted to a firm of fibre merchants, who stated that they had not previously seen such good specimens of Zapupe fibre, adding that the samples were of good growth and especially well prepared. They valued No. 1 at about £32, and No. 2 at £30 per ton in London (January 1913), with Mexican sisal at £34, and best quality Mauritius hemp at £28 to £30 per ton.

This Zapupe fibre should always be readily saleable in the United Kingdom, but the valuations given above are considerably higher than usual, owing to the recent increase in the price of sisal and other cordage fibres.



RURAL SCIENCE. By J. J. Green, B.Sc., *Macmillan & Co., Ltd.*, London 1913. 1*s.* 6*d.*

This interesting and stimulating little book has been prepared for use in the upper forms of rural secondary schools. The book is characterized by the large amount of practical work that is described, and by the clear illustrations which make the descriptions easy to understand. Although the subject-matter applies to temperate conditions, many of the ideas will be found useful in the teaching of agricultural science in the Tropics, and the text-book should be of the greatest assistance where the teacher's skill is sufficiently elastic to enable him to substitute tropical material in the place of that indicated in the book under review.

Chapter I deals with the structure and germination of seeds. Following this is an account of useful experiments on seed testing. The succeeding section of the work dealing with the plant describes the different forms of roots and shoots, the fertilization of flowers and the elementary principles of plant breeding. A chapter is given to duration in plants and vegetative reproduction. In chapter VI the composition of plants is explained in a manner which is simple, practical and suggestive.

The remaining part of the work concerns soils. The chapter on the relation of soils to water, describes, with illustrations, several very instructive experiments, which can be conveniently conducted in the class-room by means of simple and easily obtainable apparatus. The importance of the extensive work of the last few years on the biological properties of the soil is reflected to the student, by information contained in Chapters XII and XIV, where an attempt is made to induce a conception of bacterial action and its economic importance. The book concludes with a short description of the cultivation of the chief British crops, emphasizing incidentally the paramount importance of systems of rotation.

SYLVICULTURE IN THE TROPICS. By A. F. Broun. *Macmillan & Co., Ltd.* London E.C. 8*s.* 6*d.* net.

It is stated in the preface of this volume that the book was originally intended to form one of a series on agriculture in the Tropics; consequently, the materialization of this intention has been the production of a work which is not restricted in its application to any particular area.

The author commences by discussing the influence of soils upon forest vegetation, and illustrates, for example, the differences in regard to the species found on the Sudan cotton soil and on limey soils in the same country. The former soil is characterized by the large number of Acacias found, whereas on the latter formation such trees as *Adansonia digitata*, and *Sterculia cinerea* are prevalent. Proceeding to the effect of climate upon forests, the writer gives graphic descriptions of the vegetation of wet and dry situations. This chapter is followed by another dealing with the influence of locality, in which connexion, as is well known, altitude, winds and hurricanes constitute important factors. In Chapter IV the interesting biological subject of the relationship between trees and plant and animal allies and enemies is considered. Interesting facts are given concerning climbing plants like Landolphia, Laurensis and Ficus. Several fungus parasites are described. Due importance is attached in this chapter to the usefulness of insects and birds as regards pollination; and quadrupeds, like antelopes and deer, are stated to be of value in the distribution of seed. On the other hand, the usefulness of these animals is frequently counterbalanced by the damage done by certain species; in this connexion a brief account is given of some of the common insect pests of trees in the Tropics

A subject of considerable interest in the West Indies is the influence of forests on climate and locality, which forms the heading to Chapter VI. This may be read with advantage by those interested in afforestation in the West Indies.

Part II of the work deals with the formation and regeneration of forests. It would be impossible in the brief space of this review to enter into any details in regard to the large amount of information provided, but the reader's attention may be called to those parts dealing with the collection of seed and the construction and management of nurseries, where extremely interesting illustrations of tools and devices are reproduced. Following these matters comes an account of the preliminary operations that have to be carried out on an area that is to be afforested. This section, again, is in many ways of direct interest in the West Indies. A large amount of space is devoted to the subject of regeneration both by seed and by coppice.

The third and last part of the volume concerns the maintenance and protection of forest crops. After dealing first with thinnings and pruning, measures for maintenance and protection are then described, including methods for the demarcation of boundaries, for fire protection, and for the fixation of unstable soils by means of certain plants and by engineering works.

The volume is well printed and illustrated and has a useful index containing references to the different species of trees alluded to from time to time in the text.

TUBERCULOSIS IN FOWLS.

The following note dealing with tuberculosis in fowls is abstracted from the *Journal of the Department of Agriculture of New Zealand*, Vol. VI, No 2:—

Birds are most liable to this disease at the 'moulting' period, or when from any other cause the body is in a weakened condition.

The symptoms are many, but experience is required in their detection. To the untrained observer a wasted appearance is perhaps the plainest sign. Then the breast bone stands out sharply from the body, and the neck is devoid of flesh. The comb presents an unhealthy appearance. Diarrhœa accompanies the disease and the excreta are of an unnatural colour. The bird is generally seen to limp in the right leg in the later stages of the disease.

When opening up a tuberculous bird, the liver is found to be greatly enlarged, from the presence of tubercle nodules which are scattered throughout the tissue. There is, it is almost needless to add, no cure for this disease, but it may be prevented to some extent by keeping the birds in good condition, and the surroundings as sanitary as possible. A nourishing diet, with a plentiful provision of green food, clean water and grit are of much importance. Those birds which are visibly wasters should be killed, and great attention must be paid to cleansing the fowl house, and to removing all traces of infection, more particularly the droppings of affected birds.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the subject of rainfall. Various aspects of the subject in relation to agricultural practice and the topographical characteristics of different localities are considered in a general manner.

Information of considerable economic importance is presented on page 164 in regard to the feeding value of Bengal beans.

Veterinary notes, dealing with the subject of tuberculosis, will be found on pages 165 and 167.

The newly introduced fibre known as Zapupe, is described in an article on page 166.

Insect Notes, which will be found on page 170, constitute a continuation of the subject of root borers and other grubs in West Indian soils.

On page 174, important information will be found abstracted, dealing with the preparation of Para rubber in the Malay States.

Fungus Notes, on page 174, comprise two articles describing, respectively, a disease of sisal hemp and a new group of fungicides.

Publications of the Imperial Department of Agriculture.

The second number of Volume XIII of the *West Indian Bulletin*, which has recently been issued, contains an account of sugar-cane experiments in British Guiana. The authors are Professor J. B. Harrison C.M.G., M.A., F.I.C., Director; F. A. Stockdale, M.A., F.L.S., Assistant Director; and R. Ward, Agricultural Superintendent, of the Department of Science and Agriculture, British Guiana. Part I of the paper deals mainly with the probable error in sugar-cane experiments; Part II, the composition of the soil-water as affected by cultivation and manuring of the soil; Part III, the manuring of the sugar-cane; Part IV, the effects of cultivation and manures on the soil of the manurial and experiment fields; Part V concerns varieties of sugar-cane.

The Annual Report on Sugar-cane Experiments in the Leeward Islands for 1911-12 is now being distributed. This report, as in former years, comprises Part I dealing with varieties of sugar-cane, and Part II which describes the results of manurial experiments.

The Annual Report on the Antigua Botanic Station is also about to be issued, and will be followed shortly by the reports on the St. Kitts and Montserrat Botanic and Experiment Stations.

Of the Pamphlet Series, No. 73, on Lime Cultivation in the West Indies, is in course of preparation.

Lime Cultivation in Dominica.

An article on this subject appears in *L'Agriculture Pratique des Pays Chauds* (Paris) for March 1913. It is written by C. Chalot, Professor á l' Ecole Supérieure d'agriculture coloniale, in collaboration with R. Deslandes, Ingenieur d'agriculture coloniale chargé de mission aux Antilles. It is pointed out, in the introduction, that at Trinidad, Dominica, Montserrat, Jamaica, St. Lucia, Antigua and British Guiana, the products of the lime tree take an important position in the Colonies' exports, though the cultivation of this crop in Dominica constitutes the main subject-matter of the article, in view of the greater importance of the industry in that island.

A historical account of the industry is followed by a description of the different varieties grown at the present day. The requisite climatic conditions are next considered, succeeded by an account of the clearing and cultivation of the soil for planting, including a description of the method of draining the land.

The article will be continued in the next issue of the journal referred to.

Acknowledgement is made in the article of assistance rendered to one of the authors by the Curator of the Botanic Gardens, Dominica, the Manager of the Bath estate, Roseau, and by others.

The dissemination of the information in these articles in Europe and elsewhere should help to ventilate the possibilities attending a West Indian industry which is still in a state of active development. On the other hand, the information may induce efforts to extend lime cultivation in other portions of the Tropics outside the West Indies.

Agricultural Progress in British Guiana.

A copy of the agenda of a meeting of the Board of Agriculture of British Guiana on May 7, 1913, together with a summary of the proceedings contained in the *Daily Argosy* of the same date, has just been received from the Secretary of the Board.

Interesting facts are contained in this communication concerning the census of agricultural industries in British Guiana for 1912-13. In some respects it is to be feared that the returns show a serious falling off. There was nevertheless a large increase in the area under rice, 41,100 acres being under this cultivation as against 36,000 acres for the previous year. Coco-nuts, which had increased in round figures by 2,000, were now 14,000 acres. Cacao showed a falling off of some 300 acres. As regards rubber, the return was 3,000 acres, showing an increase of practically 800 acres. Limes now worked out at 739 acres as against 658, for the previous year. Ground provisions remained stationary at 18,000 acres.

Serious reductions have occurred in the number of live stock. There was a reported decrease of 15,000 head, though the figures sent in are said to need confirmation before being taken too literally.

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A Handbook of Queensland.

Interesting and reliable agricultural information is contained in the recent publication having the above title, compiled by Mr. W. B. Paton, M.A., and issued by the Emmigrants' Information Office, London.

The section dealing with the agricultural industries in Queensland, which are to a large extent tropical, gives statistics showing that the area under sugar-cane and maize are respectively 130,376 and 153,916 acres. The State and Experimental Farms situated near Brisbane and the Queensland Agricultural College are institutions for research and education. The cultivation of land is stimulated in Queensland by the Agricultural Banks Act (Consolidated) 1911, by which the Government is authorized to establish and maintain an agricultural bank to make advances to farmers for improving their farms. Sugar land may be obtained at the rate of £2 to £6 per acre. To clear and cultivate uncleared sugar land in Queensland a capital of £6 to £8 is required. The canes mature usually in twelve months after planting.

After providing information on the different tropical crops other than sugar-cane grown in Queensland, which include rice, cotton, pine-apples, coffee and bananas, the publication deals in an interesting manner with the labour conditions, describing the employment of white labour in sugar cultivation and the occasional employment of the South Sea Islanders. From January 1, 1907, to January 1, 1913, a bonus was given by the Commonwealth Government on sugar-cane grown by white labour only, of 6s. per ton calculated on cane giving 10 per cent. of sugar, and 60s. per ton on the sugar-giving contents of beet. By No. 26 of the Commonwealth Acts of 1912, the Sugar Bounty Act 1905-12 is repealed.

Lime Juice and Scurvy.

The most notable example of the effect of certain substances existing in food in only minute traces is afforded by the investigations that have led to the discovery of the cause of beri-beri. Volume IX of the Annual Reports of the Chemical Society (1912) contains a review of this work, where the well-known fact is referred to, that the disease is prevalent among rice-eating communities in which decorticated or polished rice is consumed. Whole rice does not induce the disease. The substance inhibiting beri-beri has been extracted from rice husks by water or alcohol, and an alkaloid has been isolated to which the name of oryzanin is given. Small quantities of this substance keep animals free from the disease.

More recently, in the *Journal of the Chemical Society* for March 1913, an investigation along similar lines is referred to, which has brought to light the fact that lime juice contains an anti-neuritic substance which is probably a specific cure for scurvy. The investigation was hampered by the guinea pigs experimented on refusing to take oats—a diet which leads to scurvy in these animals. Several new nitrogenous compounds were isolated from the lime juice, however, and a continuation of the investigation will in all probability lead to the recognition of lime juice as a valuable source of anti-scorbutic substances.

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Feeding Value of Cacao Husks.

An article in the *Journal d'Agriculture Tropicale* for January, 1913, deals with the results that have recently been obtained in regard to the nutritive value of cacao husks fed to milch cows.

According to chemical analysis, 2 lb. of cacao is equivalent in feeding value to 1½ lb. of bran, and this proportion was employed in the experiments. The price of the bran used was about twice that of the cacao husks.

The trial was conducted with twenty cows over a period of four months At the commencement, about 4 lb. of husk per cow per day was added to the basal ration, but after the quantity had been increased to about 7 lb., considerable difficulty was experienced in getting the animals to consume it. They became more difficult to milk. After a few days the yield of milk became lower by 7 to 8 per cent., and in one case it dropped to 20 per cent. of the normal quantity. On the other hand, the feeding of the husks increased the percentage of fat in the milk, so that the total fat content of the milk produced by the two foods was approximately the same.

Reference is made in the article to Italian work on the same subject carried out with slightly fermented cacao husks. The results of these experiments showed that the husks were of very considerable value as a food, and it is thought that the fermentation may remove certain astringent substances which are normally present in the untreated material.

INSECT NOTES.

ROOT BORERS AND OTHER GRUBS IN WEST INDIAN SOILS.

As was promised in the last issue of the *Agricultural News*, the above subject is continued in regard to the Rhinoceros beetles, and the natural enemies of the different soil-inhabiting grubs so far described in this series of articles.

The rhinoceros beetles receive their common name from the presence of one or more projections from the upper surface of the thorax, or from the head and thorax. These, in most species, are more conspicuous in the males than in the females.

The rhinoceros beetle of St. Croix and Jamaica (*Strategus titanus*). References: *Agricultural News*, Vol. XI, p. 346; *Bulletin of the Department of Agriculture*, Jamaica (November 1903), p. 250.

Strategus titanus was first reported to the Imperial Department of Agriculture as a sugar-cane pest in August 1912, by Dr. Longfield Smith, Superintendent of Agriculture, St. Croix, Danish West Indies. Subsequent correspondence has brought out the following information with regard to the insect in that island.

In 1871, *Strategus titanus* grubs were present in the soil of cane fields in St. Croix in such numbers as to cause serious injury, and in that year planters offered a price for the grubs Dr. Smith writes that the grubs eat the roots of sugar-canes, sweet potatoes and other plants, and in the case of the cane they tunnel in at the base of the stools, and eat their way up into the stalks of the cane, turning them into hollow tubes. This was written with regard to the older plants in August and September last. As regards the attacks on the young plant canes, it is stated that the eyes and the young roots are eaten off and the grubs often tunnel into the interior of the cuttings used for planting, resulting in a germination in certain fields of not more than 20 per cent.

The grubs appeared to be most abundant in August. In September many adult beetles were to be seen, and the larvae were present in smaller numbers.

Strategus titanus seems normally to be more a scavenger that a direct pest on living plants The fields in which the attacks on canes have been most severe were manured with farmyard manure, largely made up from megass. Examination of megass heaps has revealed the presence of this insect and the common hard back (*Ligyrus tumulosus*) in considerable numbers.

Dr. Smith has made trials of poisoned baits for controlling the attacks of Strategus and good results appear to have been obtained with one of these in preliminary trials. This was prepared by using megass, 100 ℔, and Paris green, 3 ℔. A handful of this mixture was placed in a hole made with a drill alongside each cane plant. After an interval of about a week the baits were examined, and a large number of dead and dying grubs were found in and near to the poisoned megass. This would indicate that a method of control has been found, and it only remains to determine to what extent this method will be effective when carried out on a large scale.

Strategus titanus is considerably larger than any other of the species dealt with in these articles. The adult beetles range from 1 inch to 1¼ inches in length, whilst the larva attains a length of about 2½ inches, and a diameter in its thickest part of about ½-inch The thoracic projections or horns which are characteristic features in the adults of many rhinoceros beetles, are represented in this species by very inconspicuous tubercles.

Strategus titanus is recorded as occurring in Jamaica, where it has been found in the decaying wood of an orange tree which was killed by attacks of the fiddler beetle.

The Curator of the Experiment Station at Tortola recently reported the occurrence of this insect in the Virgin Islands, after having seen it in St. Croix.

A large rhinoceros beetle is reported to have been a serious pest of cane on a limited area in Porto Rico, where it caused injury in excess of that resulting from the attacks of the *Lachnosterna* sp. (See reference under *Lachnosterna* sp. in Porto Rico, above.) This rhinoceros beetle is probably *Strategus titanus*, or a related species.

The rhinoceros beetles of coco-nut palms, in Trinidad, (*Strategus anachoretus*). Reference: Circular No. 5, Board of Agriculture, Trinidad and Tobago.

This insect attacks coco-nut palms in Trinidad, where the larvae are said to live in rotten wood or decaying vegetable matter. The adults, large beetles, sometimes 2½ inches in length, tunnel into the base of young trees newly planted out. The larvae sometimes occur in the soil of sugar-cane fields, where they attack canes after the manner of *Strategus titanus* larvae in St Croix.

The attack by the adult *Strategus anachoretus* on coco-nuts seems to be like that of the adult *Tomarus bituberculatus* on banana suckers, while its attacks in the larval stage on sugar-cane appear to be more like those of the larvae of *Strategus titanus* on sugar-cane in St. Croix.

At least five other species of hard backs of the sub family Dynastidae are known in the Lesser Antilles, which may be of interest in this connexion. These are:—

Cyclocephala tridentata which occurs in Dominica and St. Lucia. It is fairly abundant in the former of these islands, judging from the numbers collected from time to time. There appear to be no records of its habits in either the larval or adult stages.

Cyclocephala dimidiata is reported from Grenada, as feeding upon the flowers and flower-buds of cotton, eating the corolla and often injuring the essential organs.

Cyclocephala vincentae in St. Vincent, and two species of *Leucothyreus*, one occurring in St. Vincent and one in St. Lucia are only known from the habits of the adults of feeding on the leaves of plants, especially cacao and cotton.

The injury resulting from the feeding of any of the adult beetles mentioned in these notes, is not severe. Occasionally a few leaves may be eaten, or in some instances the adults may tunnel into the tissues of the plants and cause a certain amount of damage. The real danger from these insects lies in their capacity for harm, while in the larval or grub stage of development. In fact, in the case of the root borers and the white grubs of the hard backs in the group Melolonthidae, these may become so numerous as to cause really serious injury to crops before the adults are known to the planters. This is because many of these adult insects are not attracted to light, and they hide in the soil or among the foliage of plants during the day and thus are easily overlooked.

Whenever a beetle of any sort occurs in such numbers as to attract the attention of the planter, he should at once ask himself—Where does the larva of this beetle live, and on what does it feed?

If it is a beetle of the weevil or hard back type, such as the root borer or the common hard back, the larvae are almost certain to be found under ground, either feeding among decaying vegetable matter, or in or on the roots of living plants; or, in the case of the weevil, it may be a borer in the stems of trees or shrubs.

The larvae of the weevils referred to in these notes are all whitish grubs without legs; the larvae of the hard backs are all similar to each other in the fact that they possess three pairs of slender legs, and a long swollen abdomen or hind-body. They are also whitish in colour, but at the hind end of the body the dark contents of the anal pouch shows through the body walls, giving a dark appearance to this portion.

NATURAL ENEMIES.

(1) Of the adults.

Birds, lizards and toads are recognized as being insect feeders, and it is likely that they are the most efficient natural enemies of the adult forms of the insects considered in this series of articles.

The large weevils generally hide during the day among the leaves of plants, often remaining motionless and well concealed for a long time, and it is likely that as long as they remain perfectly quiet many of their enemies fail to observe them. The hard backs, on the other hand, emerge from the soil at night and return to hide there during the day. The toad feeds at night, largely, and on this account is able to capture large numbers of hard back beetles among the nocturnal insects which comprise its food. The predaceous enemies which capture only the adult insects cannot have a very great influence on the numbers or rate of increase of any of these beetles, since many of those which are devoured are captured only after they have fulfilled their sexual functions, that is, after mating has taken place and many eggs have been laid.

(2) Of the larvae.

The larvae of the weevils and hard backs live in such situations that they are ordinarily protected from the attacks of such predaceous enemies as birds, lizards, and toads. When, however, they are exposed, as in ploughing or forking in the field, or in breaking up infested cane stools or digging over manure and megass heaps, they are immediately open to attack mainly by birds and ants, and to a slight extent also by lizards and toads.

The most efficient form of control is found in the case of those insects which act as parasites, laying the egg in or on the immature form of the host insect, and thus providing for the sustenance and development of the young at the expense of the life of the host.

The root borers of the sugar-cane in Barbados and the Leeward Islands are not known to be attacked by parasites, but the Fiddler beetle of Jamaica is attacked by a burrowing wasp, *Elis atrata*. *Phytalus smithi* and *Ligyrus tumulosus* are attacked by other burrowing wasps of the same family,—the Scoliidae—the parasite of the former being *Tiphia paralella* and of the latter *Dielis dorsata*. The parasite larva discovered on the grub of *Lachnosterna patruelis* in St. Kitts was most likely that of a Scoliid wasp.

It is very probable that in the case of all these beetles there are parasites exercising a greater or lesser degree of control, and that more extended observations on the life-cycle of these insects will reveal the presence of these beneficial insects.

The burrowing wasps, some of which are known to be parasitic upon soil-inhabiting grubs, belong to the family Scoliidae, of the order Hymenoptera. It is of interest to note, that among these insects are to be found some which attack grubs of the Lamellicorn or Scarabeid beetles, of which one at least is a parasite of the grub of a weevil of the sub-order *Rhynchophora*.

The adults of the Scoliid wasps often exhibit a considerable difference of appearance between males and females. In the case of *Tiphia paralella*, the distinction is mainly one of size, the female being much the larger. The colour is very similar in both sexes, being black with faint lighter markings. *Dielis dorsata*, on the other hand, shows a difference in both size and colour markings between the males and females. The female is slightly larger, with large red spots on the dorsal surface of the abdomen, whilst the male in addition to being smaller, shows bright lemon-yellow markings.

These Scoliid wasps are to be seen in cultivated fields and other situations throughout the West Indies. The habit of flight is the same in all—a quick, almost darting, motion, low down, often just skimming the surface of the ground. They frequently alight for a moment as if to inspect the ground, and then resume the characteristic flight. Sometimes, however, they immediately burrow into the ground. This they do quickly, disappearing within two or three minutes.

In the case of *Dielis dorsata*, when the sexes can easily be distinguished during flight, it is noticed that the females generally burrow into the soil, although the males have been observed to do so also. The female wasp is in search of the grubs in the soil, and when she finds one of these she stings it and deposits an egg on the skin of the grub. This egg hatches and produces a parasitic grub, which attaches itself by means of its mouth parts and feeds on the body contents of the beetle grub, probably not causing its death until it (the parasitic grub) is nearly full-grown and ready to pupate.

In the case of many of the parasitic Hymenoptera, the eggs are deposited within the body of the host, and the parasitic larvae live and complete their larval development in this situation. Certain other hymenoptera capture insects and spiders, and sting them to produce immobility or paralysis, but not death. The paralysed prey is then used by the hymenoptera to store its nest, thus providing living food for its young.

Thus the method of the Scoliidae in this matter of providing for their young, appears to be intermediate between the two methods described above. The host is stung and more or less paralysed, but is not carried away; the egg is placed on, and not in, the host, and the parasite grub lives on, not in, the host.

In the succeeding issue of the *Agricultural News* will be presented a table summarizing the information given in the foregoing articles.

The Educational Value of Agriculture.—Some of the advantages of instruction in elementary agriculture are described in the *Experiment Station Record* for November 1912. It is pointed out that when well given, the advantages of this instruction are as follows: (1) it commands from the beginning a wide range of the interests most common to children; (2) it forces measures and comparison and judgment thereon, upon the child at every turn; (3) it trains a child to be careful, exact, patient and persistent; (4) it offers in the gardening work all the elementary problems of form, colour and proportion, and so lays the foundations of a sense of beauty; (5) it affords abundant opportunity for emulation and co-operation; and (6) it teaches boys and girls to work. Inasmuch as it discourages pure reasoning, students should also be taught pure mathematics, logic and languages. The author points out that 'our trouble in the past has been that we have tried to take our school children directly into this abstract world of direct thinking and exalted feeling without passing them through the preliminary stages of concrete experience, elemental virtues and active self-expressions.'

GLEANINGS.

It is stated in *The Board of Trade Journal*, for March 20, 1913, that the export of rubber from the Federated Malay States during January 1912 was 2,730,576 lb.; during January 1913 it was 4,787,280 lb.

The exports from St. Vincent during March 1913 were as follows: arrowroot 342,517lb., cacao 21,144lb., cotton—Sea Island, 63,949lb. (180 bales), cotton seed 246,178lb. (From the St. Vincent *Government Gazette*, April 17, 1913.)

Information has been received from the Curator of the Botanic Gardens, Dominica, to the effect that the cacao crop is practically over and that there is a satisfactory outlook as regards limes in view of the promising setting of the flowers.

A meeting of the St. Kitts Agricultural Society was recently held for the purpose of discussing the advantages of syrup, making over muscovado manufacture at present prices. A paper on the subject was read by the Superintendent of Agriculture for the Leeward Islands.

The total rainfall in Grenada during March 1913 was 3·42 inches; for the corresponding period of last year it was 1·99 inches. During the month, rain was received on twenty-one days; during twenty-three days the sky was clear; for eight days it was overcast. (From the Grenada *Government Gazette*, April 15, 1913.)

Reference is made in the *Colonial Office Journal* for April 1913, to the hay grass known as teff. The success of this plant in British Guiana and Australia is remarked upon, and it is pointed out that its use is spreading in South Africa. It is well adapted for dry sandy regions, though the possibility of its becoming obnoxious as a weed must not be lost sight of.

It is stated in *The Board of Trade Journal* for April 10, 1913, that H. M. Consul at St. Louis, Mexico, has forwarded a sample of fibre produced from cactus by a machine which has recently been patented in that city. The machine can be made in various sizes; the inventor is manufacturing small hand machines for sale to the cottagers in Mexico for use in their homes.

The Antigua *Sun* for April 23, 1913, states that an interesting meeting of the Antigua Agricultural and Commercial Society took place recently for the purpose of discussing the making of syrup. A paper on the subject was read by Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands. This paper will be abstracted in due course, in this journal.

In the *Agricultural News*, Vol. XII, p. 40, reference is made to the Trinidad and Tobago Board of Industrial Training. The report for the year 1911-12 has just been received in which it is stated that in the previous year there were 2,311 registered artisans, 127 registered firms or masters and seventy-one registered apprentices; this year's figures are 2,495, 137 and 131, respectively.

Information is presented in the *Financier and Bullionist* for April 17, 1913, to the effect that the banana crop in Jamaica for 1912 was considerably smaller than usual owing to the exceptionally protracted drought. The loss for the whole island last year was estimated at about 4,000,000 bunches. During the calendar year 1911, Jamaica shipped a total of 16,497,385 bunches, valued at $7,088,451, a sum representing more than half the total value of all the exports for that year.

According to information presented in the *Bulletin of the Imperial Institute* for January-March 1913, the output of the cacao crop in the Gold Coast for 1912 was 86,197,151 lb. valued at £1,642,736. Although this represents a decrease of 3,285,075 lb. as compared with 1911, the quality of the cacao has improved, the value showing an increase of £29,278. These figures are suggestive as regards the possibility of the competition of the Gold Coast being felt in the West Indies in connexion with the production of high grade cacao.

It is stated in the Report of the Department of Agriculture of the Union of South Africa for 1911, that in Natal Province forty-two outbreaks of epizootic lymphangitis (pseudo- or Japanese farcy) have occurred, but in the majority of cases they have existed in districts where the disease has been present for some years. Very few cases have been met with in districts hitherto looked upon as free from the disease. All clinical cases are destroyed, compensation is paid, and a certain amount of control is maintained over the in-contact animals. It may be noted that in the West Indies no similar control is exercised.

A review appears in the *India Rubber Journal* for April 12, 1913, of a recent work entitled *The Rubber Tree Book*, by W. F. de Bois McClaren. The object of the author has been to produce a book containing information which will give material assistance to those desirous of gaining an insight into the problems of rubber plantation work, and of creating a more intelligent interest among planters actually engaged in the growing and preparation of rubber. It is stated in the review under consideration that the publication is assured of a good sale, and it is confidently recommended to all interested in rubber. The price of the book is 11*s* 6*d* (abroad). The publishers are Messrs. McClaren & Sons, Ltd., London.

STUDENTS' CORNER.

JUNE.

First Period.

Seasonal Notes.

During this quarter, yams that have been allowed to remain in the field should be dug, and students should note the difference between those so kept compared with yams that have been harvested and stored directly they ripened.

Yams will also be replanted during this quarter, and students should observe the growth of the plants where large sets have been used for replanting, as compared with small ones. Observations should also be made on the manner of applying farmyard manure, whether underneath the yams or spread on the surface around them. Note any difference in the yields resulting from each method of application.

A number of sweet potato cuttings will, in all probability, be planted during this quarter, and where there is any Scarabee (*Cryptorhynchus batatae*) present, a certain number of cuttings should be soaked in Bordeaux mixture and the effect noted. How long can the cuttings be kept before planting?

About the present time a good deal of corn and cotton will be planted and an opportunity may be taken to study some of the aspects of germination.

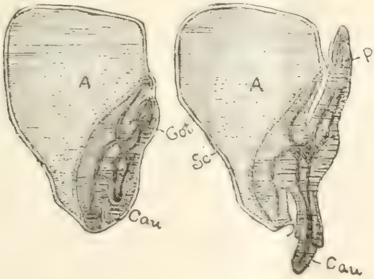

Fig. 6. Germination of Indian Corn.

The internal appearance of a germinating monocotyledonous seed is shown in Fig. 6. What are the names of the structures indicated by the different letters? The internal characters of cotton seed should be compared with those of the maize. The following instructive experiment can be carried out in a field of recently planted corn or cotton.

Cover a few square yards of the bare soil with light trash, another similar area with soot or charcoal dust, another with lime, another with small stones, and still another may be pressed down tight or rolled. Make observations as to which treatment is quickest to stimulate germination. The cause of any differences will be due to the effect of the coverings on the soil temperature and water-supply. The results will be regulated, to a large extent, by the depth at which the seeds are planted.

In several islands in the West Indies where conditions are sufficiently moist, Para rubber is being extensively planted. In dry localities Jequié Maniçoba is being tried. Careful attention may be paid to the article on Para rubber preparation in this issue, because one of the chief difficulties attending Castilloa cultivation in the West Indies is the coagulation of the latex. The results described may throw some light on the problem. In conjunction with the article referred to, read the note on the watering of tapping cuts (Vol. XII, p. 121) and the following: Experiments with Hevea in Ceylon, Vol. XII, p. 10; Effect of Tapping upon the Composition of Rubber, p. 43; Pea Disease of Rubber Trees, p. 62; Tapping of Rubber Trees, p. 62; Function of Insoluble Constituents of Rubber, p. 105; the World's Production of Rubber, p. 132.

Questions for Candidates.

Preliminary Questions.

(1) What circumstances prevent flowers setting fruit?

(2) Write a short account of the movements of subsoil water.

Intermediate Questions.

(1) Mention any two recent inventions that are likely to prove of value in tropical agriculture. Discuss their application in practice.

(2) Describe a new stock for oranges.

Final Questions.

(1) Write an account of the employment of explosives in agriculture.

(2) What is bovine tuberculosis? What measures have been adopted in many places for its eradication?

Medicinal and Other Properties of the Papaw.—The following interesting information is taken from the *Tropical Agriculturist* for February 1913. 'The milky juice of the unripe fruit of the Papaw tree is admitted by high medical authorities to be an efficient vermifuge, and a similar property is possessed by the seeds, which have a pleasant flavour resembling that of cress. The juice is also a good cosmetic, which is used for the removal of freckles. But the most remarkable thing connected with the Papaw tree is the property possessed by the milky juice of the unripe fruit of separating the fibres of flesh and making it tender. The late L. A. Bernays, who was undoubtedly a reliable authority on the properties of plants and fruits, says, in his valuable work on "The Cultural Industries of Queensland," that this property is not confined to the juice of the fruit, but the very exhalations of the tree are said to possess it; and of this fact the Brazilian butchers take advantage to make their toughest meat saleable. This is accomplished by suspending the newly-killed meat in the tree, or by wrapping it in the leaves. So powerful is this softening action of the juice that it must be used with caution, the meat will drop to pieces, which makes it more unpalatable than if left in its original condition of toughness.

'Some interesting experiments were made some years ago upon this subject at the Royal Agricultural Museum, Berlin. A portion of the juice was dissolved in three times its weight of water, and this was placed with 15lb. of quite fresh, lean beef in one piece in distilled water, and boiled for five minutes. Below the boiling point, the meat fell into several pieces, and at the close of the experiment it had separated into coarse shreds. The juice can be dried without losing its effect, but its efficiency in this respect does not appear to have been tested over a longer period than six months.'

FUNGUS NOTES.

A DISEASE OF SISAL HEMP.

For some years specimens of diseased Agave have been observed in India, the injury being in most cases confined to the leaves of the plant, on which are produced small circular patches that eventually turn black in colour, and become surrounded by small erumpent nodules. A similar condition has been noted in German East Africa, where sisal hemp is extensively cultivated, and formerly in this country it was thought that the condition was induced by excessive isolation, since it was found possible to produce the blackening by exposure to high temperatures such as frequently occur at midday in that Colony.

While it is not disputed that excessive isolation, especially when the rays of the sun are concentrated through drops of water, may produce burnt and discoloured patches of the leaf, yet recent work by Shaw in India (published in the *Agricultural Journal of India* for January, 1913) has demonstrated that in that country, the disease is due to the attacks of a parasitic fungus.

The name of the fungus is *Colletotrichum Agaves.*

In the inoculation experiments which were made with the object of definitely ascertaining the parasitic nature of the organism, wound infections had two effects according to whether the host succumbed or resisted the disease. In the first case the whole leaf turns yellow, the change in colour spreading from the seat of infection. As the disease advances, the yellow colour changes to black, and small black acervuli (fruit bodies) of Colletotrichum are produced and, in most cases the acervuli are distributed in concentric rings. The whole leaf becomes shrunken and dry, the cuticle being thrown into a series of ridges and furrows.

If the host plant resists the attack of the fungus the progress of the disease is much slower In this case the damage is confined to the leaf immediately around the source of infection. Acervuli are produced in concentric rings as in the more extensively diseased specimens. The hyphae eventually burst through the epidermis (skin) as a mass of conidiophores bearing spores. In those cases where the diseased portion of the leaf is restricted to a small area surrounding the seat of infection, a section through the junction of the diseased and healthy tissue shows a layer of cork cells across which the hyphae do not penetrate.

Other infections made by laying pieces of agar culture upon the uninjured upper surface were not successful, indicating that *Colletotrichum Agaves* is a wound parasite, which is not surprising considering the thickness of the cuticle of the Agave leaf

It is not unusual to find longitudinal cracks in the leaves of Agaves especially after a period of hot dry weather; such breaks in the superficial tissues would afford a ready means of infection from wind-borne spores. Collecting and burning diseased leaves, the prevention of accidental injury to the leaves, and spraying with Bordeaux mixture, are methods which are recommended in India, as likely to be efficacious in checking the disease.

The fungus may occur in the West Indies, but so far it appears not to have been noted or described.

A New Group of Fungicides.—The following note, taken from the *Experiment Station Record*, Vol. XXVII, No. 9, deals with chemical solutions that have recently been found useful for spraying diseased plants in Italy. It is possible that they may be of value, for certain diseases, in the West Indies:--

'The polysulphides of calcium, barium, and zinc with sodium have shown an efficacy equal or superior to that of Bordeaux mixture in controlling *Exoascus deformans* and other fungus diseases of peach and apple. They have also been used with success against Oidium of rose, oak, and euonymus, against *Exobasidium azaleæ*, etc. These polysulphides and combinations thereof with Bordeaux mixture, acetate of copper, and nitrate of silver, are recommended as efficacious also against Peronospora and Oïdium of the grape. The polysulphides of barium and zinc with sodium, are said to show a stimulating action on vegetation, especially that of peaches, and to be harmless to both leaves and flowers, whereas those of calcium are fatal to the foliage of the peach'.

THE PREPARATION OF PLANTATION PARA RUBBER.

A lengthy paper on the above subject embodying the results of some twenty-seven series of experiments comprises *Bulletin* No. 17 of the Department of Agriculture, Federated Malay States. The author is B. J. Eaton, Agricultural Chemist on the staff of that Department, and the information presented in the publication should be of very considerable practical value to those interested in Para rubber and its preparation. In the present article the results obtained are briefly abstracted.

Dealing first with the minimum quantity required of each one of the principal acids and salts to effect complete coagulation of a normal or average latex containing about 30 per cent. of dry rubber, the writer presents figures which disagree with those obtained previously by Parkin. Thirty-one coagulants were tried, and the minimum quantity required was generally smaller than formerly supposed, in several cases, particularly as regards the common acids (acetic, sulphuric, etc.) very much smaller than those advocated by Parkin.

In connexion with the maximum amount of coagulant required, Eaton states that there is no maximum figure for either acetic or any other coagulant, that the process of coagulation—except when an excess of the agent is added—depends on a time factor, and that complete coagulation with the minimum quantity of coagulant is not usually effected under three to five hours. This result is claimed to negative Crossley's figures The author explains the changes on a dilution and adsorption basis.

The third series of experiments concerned the choice of a coagulant, and the most interesting result obtained in this direction, was the indication that an excellent coagulant is to be found in sulphuric acid. If used with care, this acid is superior in some of its effects, and more economical than the commonly employed acetic acid Many coagulants affect the colour of the rubber. For instance, tannic acid causes excessive darkening or oxidation; hydrofluoric acid, on the other hand, produces a light-coloured rubber.

The experiments to ascertain the effect of dilution with water, which follow, proved that if an average latex (containing about 30 per cent. of dry rubber) is diluted with water beyond a certain limit, no coagulation occurs with the minimum amounts of coagulant already referred to. This maximum limit is usually about two volumes of water to one volume of pure latex. The rubber was found to be much softer and weaker from the dilute solutions, the quality being in direct correspondence with the dilution. The addition of water to the cups is not recommended.

In the fifth section of the paper, dealing with the length of period of coagulation, it is recommended that latex should be coagulated slowly by using only a slight excess beyond the minimum amount of acetic acid necessary, and a 5-per cent. solution of the acid. The resulting rubber should be left overnight and passed through the machines on the following day.

Of the substances which inhibit coagulation, dealt with in the succeeding section, sodium and potassium hydroxide were found to have a marked inhibiting effect, whilst both barium and calcium hydroxide solutions had a peculiar agglutinating effect on Hevea latex: the latex thickened to a marked extent, but no cohesion of the particles occurred, that is, no real coagulation took place. The general conclusion is reached, that latex solutions behave in the same way as other emulsions or colloid solutions, and that the action of the coagulant on the caoutchouc globules or particles, does not need the assumption of any preliminary action on the proteid matter by which the rubber globules are subsequently entangled or precipitated.

Interesting results accrued from the next investigation on the effect of iron salts on raw rubber It was demonstrated that absolute cleanliness should be preserved when metallic cups are used in collecting, because iron salts not only darken the rubber, but also cause it to become soft and tacky. Since perfect cleanliness is almost impossible, glazed earthenware, porcelain or glass cups should be substituted for those made of iron. The rollers of all washing machines should also be kept free from rust.

As regards the effect of common salt on rubber, dealt with in the eighth section, it was shown that the presence of this compound, because of its hygroscopic property, checked drying, and incidentally induced the attacks of fungi and bacteria from the air. In connexion with the effect of using peaty water in collecting, and for washing—frequently necessitated in outlying districts of low elevation—it was found that for washing it was not unsuitable, but its employment in the collecting cups resulted in an undesirable darkening effect. Treatment of such water with small quantities of lime was found to eliminate this effect.

In the succeeding section, the effect of sunlight on rubber is dealt with. Experiments in this direction showed that samples exposed to the sun's rays became tacky, the tackiness increasing with the length of exposure. Samples of 'crepe' appeared to become tacky more rapidly than sheet, owing, probably, to the greater amount of surface exposed. Another observation proved that the tackiness was due to exposure, for when the rubber samples were protected by the wooden bars of the window in which they were suspended, the surface of these places was quite free from tackiness. The ability of copper salts to induce tackiness is demonstrated in the next section, and it was found that, so far as these experiments went, tackiness on rubber samples could not be traced to the use of copper rollers in the Malayan washing machines.

The subject will be continued in the next issue of the *Agricultural News*.

FORESTRY IN HAWAII.

The following summary of interesting and valuable recommendations is taken from the Report of the Board of Commissioners of Agriculture and Forestry of Hawaii, for 1910-12:—

From the statements in the foregoing pages (of the report) it should be evident that at the present stage of the game in Hawaii the essential need in forestry is for the better production of the native forests. And this is required not because of the worthiness of the forest in itself to be cared for, but because on the forest depends the continuance of an assured water supply. There are other needs, too, for there is much forest work in Hawaii that requires urgently to be done, to say nothing of tree planting on waste lands that will unquestionably be of profit to those who undertake it. But first and foremost at this time comes the call for better care of the existing forests on the watersheds. The necessary steps to be taken are fencing and the eradication of wild stock in the forest reserves—cattle, goats and pigs—which should be followed by the extension of the forest, through planting, where the cover has been broken from any cause.

To carry out as it should be done, these extensions of forest work will necessarily require larger expenditures than have been made in the past. To meet this demand a portion of the revenues now derived by the Territorial Government from water licenses on streams in the forests should be devoted to forest work In a word, some of the money derived in these islands from water, a product of the forest, should be re-invested in the forest, to the end that for the future the supply of water may be assured, if indeed it cannot be increased. A revolving fund so established will, in the end, pay itself back many fold. It is the experience of all countries where forestry is practiced that the re-investment, up to a certain point, in forest administration of the revenue derived from the forest, leads to an increase in subsequent returns. Hawaii would be no exception to this general law. Provision should be made for getting the adequate protection of the forest started without more delay. This is a matter that should be brought in the most forcible way possible to the attention of the Legislature.

Along with the adequate protection of the native forest, the activities of the Division of Forestry should be carried on in accordance with the general programme that has been in force for the past several years. The growing and distributing of seedling trees, free or at cost price, from the Government Nursery at Honolulu and from sub-stations on the other islands; the extension of this work through the establishment of additional sub nurseries in other districts; the continuation of the policy of furnishing advice and suggestions as to tree planting and other forest work; and the prosecution, for a while longer, of the campaign of education as to the necessity and desirability of forest work, until a larger proportion of the owners of fee simple land that should be under forest cover, take effective steps to make it so; these are all lines of activity that should be continued, that could to the advantage of the people of the Territory, very well be expanded.

In addition, tree planting by private corporations should be further encouraged, both as to the planting of stands of commercially valuable trees for fuel, posts, etc., on waste areas near plantation camps, and also as to spreading the Algaroba forests along the sea coasts of the several islands.

The forest fire danger in Hawaii is fortunately not great in most districts, but for this very reason all the more care should be taken to keep fire out of the forest altogether. New comers to Hawaii have difficulty in appreciating how inflammable much of the vegetation is, even in the true wet forests. With the increasing necessity for keeping our water sheds in the best possible condition it is essential that no chances be taken with fire.

MARKET REPORTS.

London.—The West India Committee Circular, May 6, 1913; Messrs. E. A. de Pass & Co., April 25, 1913.

Arrowroot—3¾*d.* to 5*d.*
Balata—Sheet, 2/8; block, 2/- per ℔.
Beeswax—£7 17*s.* 6*d.* to £8.
Cacao—Trinidad, 71/- to 77/- per cwt.; Grenada, 64/6 to 69/-; Jamaica, 62/- to 68/-.
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Copra—West Indian, £29 per ton.
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Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet. 38/- to 62/-.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 1/6 to 1/8; concentrated, £24 to £24 10*s.*; otto of limes (hand-pressed), 11/- to 11/6.
Logwood—No quotations.
Mace—1/9 to 2/9.
Nutmegs—5¾*d.* to 6*d.*
Pimento—2⅛*d.* to 2⅜*d.*
Rubber—Para, fine hard, 3/5; fine soft, 3/4½; Castilloa, 2/6 per ℔.
Rum—Jamaica, 2/3 to 6/- per gallon.

New York.—Messrs. Gillespie Bros. & Co., May 2, 1913.

Cacao—Caracas, 14c. to 15c.; Grenada, 14c. to 14¼c; Trinidad, 14c. to 14¼c; Jamaica, 12c. to 13¾c.
Coco-nuts—Trinidad and Jamaica, selects, $36·00 to $37·00; culls, $25·00 per M.
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Ginger—8¼c. to 10¾c. per ℔.
Goat Skins—Jamaica, 53c.; Antigua and Barbados, 48c. to 50c.; St. Thomas and St. Kitts, 44c. to 46c. per ℔.
Grape Fruit—Jamaica, $2·25 to $3·50
Limes—$8·00 to $9·00
Mace—48c. to 50c. per ℔.
Nutmegs—110's, 12⅛c.
Oranges—Jamaica, $3·00 to $3·50 per box.
Pimento—4¼c. per ℔.
Sugar—Centrifugals, 96°, 3·36c. to $3·39c. per ℔.; Muscovados, 89°, 2·86c. to $2·89c.; Molasses, 89°, 2·61c. to $2·64c. per ℔., all duty paid

Trinidad.—Messrs. Gordon, Grant & Co., May 12, 1913.

Cacao—Venezuelan, $14·50 to $14·65 per fanega; Trinidad, $13·90 to $14·40 per fanega.
Coco-nut Oil—$1·10 per Imperial gallon.
Coffee—Venezuelan, 16c. per ℔.
Copra—$5·00 per 100 ℔.
Dhal—$4·25 to $4·50.
Onions—$2·50 to $4·00 per 100 ℔.
Peas, Split—$6·15 to $6·20 per bag.
Potatoes—English, $1·40 to $1·80 per 100 ℔.
Rice—Yellow, $5·50; White, $5·75 to $6·00 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., May 17, 1913; Messrs. T. S. Garraway & Co., May 16, 1913; Messrs. Leacock & Co., May 10, 1913.

Arrowroot—$4·75 to $7·50 per 100 ℔.
Cacao—$12·00 to $14·00 per 100 ℔.
Coco-nuts—$18·00
Hay—$1·50 per 100 ℔.
Manures—Nitrate of soda, none; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $85·00 per ton.
Molasses—No quotations.
Onions—$1·03 to $2·25 per 100 ℔.
Peas, Split—$6·00 to $6·25 per bag of 210 ℔.; Canada, $4·40 per bag of 120 ℔.
Potatoes—Nova Scotia, $2·00 to $3·65 per 160 ℔.
Rice—Ballam, $5·05 to $6·10 per 190 ℔.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $4·00 per 100 ℔.

British Guiana.—Messrs. Wieting & Richter, May 10, 1913; Messrs. Sandbach, Parker & Co., May 9, 1913.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	8c. per ℔.	——
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per ℔.	——
Cacao—Native	20c. to 21c. per ℔.	19c. per ℔.
Cassava—	72c.	——
Cassava Starch—	$5·00 to $6·00	——
Coco-nuts—	$16 to $20 per M.	$10 to $16 per M.
Coffee—Creole	17c. to 18c. per ℔.	18c. per ℔.
Jamaica and Rio	18c. per ℔.	19c. per ℔.
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Molasses—Yellow	None	——
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Madeira	7c. to 8c. per ℔.	——
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Marseilles	——	——
Plantains—	16c. to 40c.	——
Potatoes—Nova Scotia	$2·25 to $2·50	$2·40
Lisbon	——	——
Potatoes-Sweet, B'bados	96c. per bag	——
Rice—Ballam	No quotation	——
Creole	$4·75 to $5·00	$5·00
Tannias—	$1·20	——
Yams—White	$1·68	——
Buck	$1·44	——
Sugar—Dark crystals	$2·25 to $2·30	$2·30
Yellow	$3·00 to $3·25	$3·25
White	$3·75 to $4·00	$5·00
Molasses	$2·00	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
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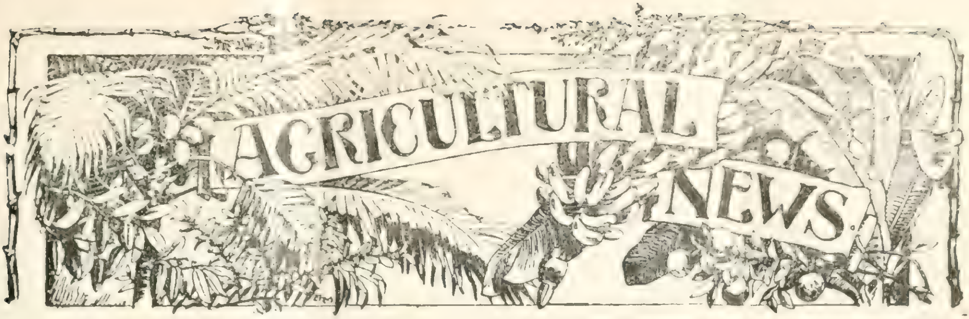

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Contact Between Planter and Specialist.

NOBODY at the present day can fail to appreciate the enormous gulf that divides the practical man or capitalist from the specialist in science. The separation of the two positions is very patent in modern agriculture, and can be vividly realized by contrasting the mental outlook of, say, the manager of a large sugar estate, and that of the entomologist whose faculties are concentrated on the wing markings of half a dozen species of insects. It is obvious that a proper relationship, or rather a proper communication or contact between the two is of the very greatest importance, and it is the object of this article to delineate the position of the specialist, and to point out the methods that are, or should be adopted, in order that his activities may be utilized to the best advantage.

In most of the progressive agricultural communities in the Tropics will be found to exist Departments, Boards, or else entirely non-official agricultural organizations, which employ the services of scientific specialists —agricultural chemists, mycologists, entomologists and the like. Strictly speaking—the matter will be enlarged upon later—these so-called specialists are not pure specialists, for in many cases they possess a good general knowledge of agriculture; yet in spite of this, their work is sufficiently restricted to narrow lines of investigation to render their mentalities quite different to those of practical planters. In order to contrast clearly the two types, it will be convenient to adopt a figurative illustration. The ability of the specialist may be considered as being represented by a long, narrow, vertical rectangle—his knowledge is deep rather than broad. That of the practical agriculturist can be symbolized in the shape of a square—his knowledge is of a normal nature and quite unspecialized. Clearly these two figures may be equal in area, thereby indicating a common value as regards potential ability, but the essential feature of the conception is that the two figures are so dissimilar in shape that they cannot be made to fit when placed side by side. Occasionally, as already hinted, where the specialist has received a general training, and also in a case where the practical agriculturist has received a special training, the resulting figures have more in common, and may fit fairly well. This ideal condition is seldom found, however, and at present it is generally necessary in tropical communities to have an organization at the back of the specialists, of which the main function is to connect up the two dissimilar types just described.

It is evident that the knowledge of the specialist is a source which must be tapped. In spite of Departments and other organizations, there is a strong tendency in the Tropics, to-day, for men who were originally specialists to have so acquainted themselves with the point of view and the requirements of the practical planter that they have become practitioners in the branch of science in which they are interested, and this is frequently followed by their becoming established in purely administrative positions where they direct the work, and disseminate the results of younger specialists who follow in their wake. The necessity for feeders of knowledge is greater than the necessity for producers of knowledge. This peculiar and most important trend is not altogether desirable, for it leads to the loss of research men just as they are in possession of valuable experience and in a position to tackle local problems deftly and with assurance. In fact, to-day we find the pure specialist more or less confined to the great centres of learning in temperate countries. There is need for more of these men in the Tropics; but, until tropical public opinion better appreciates the value of abstract research by learning how to tap it, there is little prospect of such a change being brought about. In medicine, to strike a parallel contrast, the value of the specialist is clearly understood. The significance of a serious affection of the eye or of the throat for instance, is at once appreciated, and information is obtained by intelligent people at the right time and from the right authority. On the other hand, of course, an occasional ailment of these organs may be treated without the aid of skilled assistance. Judgment is exercised. In agriculture, a similar attitude is very uncommon. In agriculture the tendency is in the direction of *laissez faire*: unless the specialist rises from his microscope and searches for something to treat, results will be wasted. His mind, however, by interruption, is taken off his work, and the results have to suffer in any case.

The solution to these difficulties lies mainly in the fact that education and research should go hand in hand under proper conditions. At present there are two many isolated attempts at research in the Tropics and not enough in the direction of broad education. The research man should be allowed to teach the young generation he will later advise.

Agricultural education has from time to time been subjected to considerable ridicule by practical agriculturists, even by those who have received one. That is because it has not been correctly administered. Education in agricultural science should have for its main object the teaching of where, when and why to apply for advice, and not aim merely to instil isolated facts and operations or to train specialists. The student who intends to cultivate land should not, for instance, be taught how to analyze a soil, but rather under what conditions a soil should be analyzed and the usefulness of the results.

Consequent on such a widening of the practical man's square—to speak again figuratively—his contact with the specialist will be increased without interfering either with his own particular depth and kind of information or with that of the specialist. It is true that specialization might progress, under such conditions, more rapidly than the practical man could keep up with, in which case the class of scientific practitioner already referred to, would quickly evolve; but it would be from a different cause, a more desirable cause than that which necessitates the combination of agriculturist and scientific specialist in one, at the present day.

With the extended appreciation of scientific results by the agriculturist, the necessity for a large number of agricultural departments would tend to diminish. The State would be relieved of responsibility. Taxation would be less. The planter does himself what he payed others to do. Men of administrative ability would be required in the various communities to direct local co-operative movements it is true, but they would be entirely unofficial. A priori, one other thing would be necessary. Those who intended to undertake the cultivation of the land, who did so with the fixed intention of discreetly utilizing the knowledge of the specialist, would need to be catered for by the establishment of an inexpensive and easily accessible tropical agricultural university.

Several facts concerning the use of kainit, the potash manure, as a fungicide, are contained in an extract from the *Journal of Agriculture*, Victoria (pp. 737 and 738). It is said that useful results have accrued from spraying leaves of certain plants with a solution of this manure. It does not appear to have any perceptible effect in the prevention of disease when applied in the usual way as a manure. One curious action of kainit is worthy of note. It seems that when applied to the soil in large amounts, the manure increases the conductive power of the soil for heat, and hence keeps the temperature more uniform. In Germany, it was found to reduce the formation of frost.

SUGAR INDUSTRY.

THE MANUFACTURE OF SYRUP.

The present depressed condition of the sugar market has directed the attention of sugar-cane growers in many parts of the West Indies to the possibilities involved in the manufacture of cane syrups in preference to muscovado sugar and molasses.

The question has recently received considerable attention at Antigua and St. Kitts, where special papers on the subject have been read by the Superintendent of Agriculture for the Leeward Islands at meetings of the local Agricultural Societies The present article is an abstract of a paper read by the officer referred to above (Mr. H. A. Tempany, B Sc., F.I.C.) at a special meeting held in Antigua.

Consideration is given first in the report to the pecuniary aspect of syrup making. From calculations based on the composition as determined by analysis of a large number of muscovado massecuites, it has been found that the equivalent of 1 ton of muscovado sugar and 60 gallons of molasses in terms of syrup of the standard density of 40° Beaumé, is 273 Imperial gallons. Assuming the price of muscovado sugar to be $1·60 per 100 lb., f.o.b., Antigua, that of molasses to be 24c. per gallon including the cost of package, and that of syrup also 24c. per gallon including package, then a simple calculation will show that the manufacture of syrup as against sugar and molasses on the above terms will yield a profit amounting approximately to $7·80 on each ton of sugar made. As Mr. Tempany points out in the report, the whole question resolves itself into that of the relation of the prices of sugar and molasses. With muscovado sugar at a low price, and molasses and syrup selling well, it pays to make syrup; when the reverse is the case sugar-making seems likely to remain the more profitable undertaking

In a paper published in the *West Indian Bulletin*, Vol. X, dealing with the subject of Central Factories, Dr. Watts, Imperial Commissioner of Agriculture for the West Indies put forward an interesting tabular statement of relative actual values of syrup and sugar based on the current market value of muscovado sugar. The table in question has been calculated in terms of wine gallons of syrup, the measure current in Barbados and the United States of America.

In order to facilitate reference as regards those interested in the matter in the Leeward Islands, this table has been recalculated in terms of Imperial gallons, the standard measure in Antigua, and is included in the following:—

Value of 100lb. of muscovado sugar, f.o.b., Antigua.	Equivalent value of 1 gallon of syrup in terms of the price of muscovado sugar.	
	Wine gallon.	Imperial gallon.
$1·60	13·9c. to 14·2c.	16·7c. to 17·0c.
$1·70	14·8c. ,, 15·1c.	17·8c. ,, 18·1c.
$1·80	15·7c. ,, 16·0c.	18·8c. ,, 19·2c.
$1·90	16·5c. ,, 16·9c.	19·8c. ,, 20·3c.
$2·00	17·4c. ,, 17·8c.	20·9c. ,, 21·4c

The advantage in favour of syrups is given by the difference between the market price of syrup, f.o.b., and the value given in the third column, including in both cases the cost of the package.

Turning from the financial side of the subject to the various matters of manufacture, Mr. Tempany points out that the fundamental object in making syrup is to restrain crystallization entirely. In order to secure this it is necessary that a certain quantity of the cane sugar originally present in the juice should be changed into invert sugar or glucose. The type of reagent which brings this change about is an acid. Rapid inversion can be secured by using strong mineral acids like sulphuric acid, but their use is precluded on account of the American and Canadian Pure Food Laws. Vegetable acids like lime juice might equally well be used though the cost of doing so would be considerable.

By far the best way of bringing about the inversion is that commonly employed in Barbados, namely, by using sour cane juice. As regards the quantity required, experiments conducted recently in the Government Laboratory show that in juices occurring in Antigua the amount of acidity developed in the first twenty-four hours varies within relatively narrow limits. Subsequently the rate of souring in the case of different varieties would seem to be subject to variation of some magnitude. From this it would appear that by employing fixed quantities of sour juice approximately twenty-four hours old, to effect the necessary inversion, a certain degree of control is capable of being established with comparative ease.

In Antigua, it seems that 80 gallons of sour juice twenty-four hours old, added to each 420 gallons of fresh juice—i.e. 80 gallons of sour juice in each 500-gallon clarifier—will produce the required degree of inversion.

Considerable attention is next given by the writer to the question of liming in syrup manufacture. Mr. Tempany is of opinion that sour juice and lime have a similar effect as regards clarification, namely they both assist the coagulation of the albuminoids which rise to the surface as the familiar black scum, and therefore, in the particular case under consideration, it would seem unnecessary to add any lime, though considerable diversity of opinion exists as to the desirability of 'tempering' in the manufacture of syrup.

The writer attaches great importance to the cleaning of tayches during boiling, and to the removal of impurities. The question of density or specific gravity is next considered. It is pointed out that, in practice, the standard required of the finished syrup is, that when it is cold it should have a specific gravity of 40° Beaumé. This syrup, at its boiling point, corresponds to 35° Beaumé.

The main requirements of the finished syrup are that it should be of good colour, clear and bright, free from sediment, and from salts of iron. The presence of the latter compounds causes a darkening to take place when the syrup is added to an infusion of tea. Above all it is of importance that in keeping it should not sour, nor should it deposit crystals of sugar. As regards the commercial grades, the writer is of opinion that the Barbados sugar producers' standard of 40° Beaumé and 40° polarization is the one that should be aimed at. Mention is made of a demand that exists in Barbabos for heavy fancy molasses of specific gravity of 41° Beaumé: this apparently may command a slightly higher price than the normal article

In concluding the report it is stated that the manufacture of syrups cannot be regarded in any sense as a satisfactory substitute for the introduction of a Central Factory system. On the other hand, it would seem a sound policy, for those planters who are content to grind their own canes, to manufacture syrup, providing the market prices are such as to make it financially justifiable.

FRUITS AND FRUIT TREES.

THE ECONOMIC VALUE OF THE WEST INDIAN GRU-GRU PALM.

Early in 1911, information was received at this office from the Superintendent of Agriculture, Grenada, to the effect that enquiries were being made in that island as to the possibility of the disposal by sale of the fruit of the gru-gru palm (*Acrocomia sclerocarpa*), and that information was required by planters and others as to the prices likely to be obtained if such disposal could be made.

Towards the end of October 1912, a communication was received from the Director of the Imperial Institute, stating that similar enquiries were being made in London, and asking to be informed as to the possibility of establishing an export trade in this product from the West Indies. This was accompanied by a request that representative samples of gru gru kernels might be sent to the Imperial Institute for examination and valuation.

Agricultural officers in the Windward and Leeward Islands were communicated with, and early in 1913 a sample of the kernels was obtained from Grenada and forwarded as requested to the Imperial Institute. Later a sample of expressed oil was also sent.

In the letter of transmittal, the Imperial Commissioner of Agriculture pointed out that the tree grew freely in Grenada on poor, rocky hill sides and that it might usefully provide material for export without interfering with other crops. It was also stated in this letter that the trees existed in some numbers in St. Vincent but that they were being destroyed to make way for cotton cultivation: in St. Lucia they existed in smaller numbers. No considerable number was found to occur in the Leeward Islands but they occurred to some extent and might doubtless be increased. Considerable numbers were stated to exist in Trinidad.

The fact was also noted in this communication that the gru-gru palm is freely attacked by the palm weevil (*Rhynchophorus palmarum*), which circumstance would have to be kept in mind when suggesting the cultivation of the gru-gru palm near coco-nuts.

Quite recently a report on the material forward for examination has been received from the Director of the Imperial Institute, Professor Wyndham Dunstan, C.M.G., M.A., F.R.S., and is reproduced as follows:—

DESCRIPTION OF SAMPLE. 'The sample consisted of about 13 lb. of rounded brown nuts, slightly flattened at the base and bluntly pointed at the apex. The length from apex to base was ¾- to 1 inch, and the diameter was 1 to 1⅛-inch, being thus greater than the length. Each nut possessed three "eyes" situated about halfway between the apex and the base.

'The shells of the nuts were hard, brittle and woody; they measured slightly over ⅛-inch in thickness. The kernels, which were of irregular shape, were dark brown externally and white within, and were somewhat similar in appearance to ordinary oil-palm kernels (*Elaeis guineensis*).

RESULTS OF EXAMINATION. 'The kernels, which were found to contain 7·3 per cent. of moisture yielded 56·2 per cent. of a white crystalline fat. This product resembled coco-nut oil, but it was more opaque and had a less marked odour; it also resembled palm-kernel oil. It was examined with the following results, compared with the corresponding figures for palm-kernel oil:

	Gru-Gru fat.	Palm-kernel oil.
Specific gravity at 100°/15·5°C.	0·868	0·8731
Acid value	1·5	——
Saponification value	255 1	242·4 to 254·8
Iodine value, per cent.	21·0	10·3 to 17·5
Titer test	20·5°C	20·0° to 25 5°C
Hehner value (approx.)	89·5	91·1
Reichert-Meissl value	6·8	5·0 to 6·8
Unsaponifiable matter, per cent.	0·46	——
Polenske value	10·0	——

COMMERCIAL VALUE. 'The present value of oil-palm kernels in the United Kingdom is from £22 6*s*. 3*d*. to £23 2*s*. 6*d*. per ton, ex-quay Liverpool (April 1913), and gru-gru kernels should fetch about the same price, since they are as rich in fat as palm kernels. The gru-gru kernel oil, however, is a little softer than palm kernel oil, and this may make a slight difference in the price obtainable for the kernels. This point, however, can only be determined after consignments have been marketed, and manufacturers have been able to try the oil on an industrial scale in comparison with coco-nut and palm-kernel oils.

'Experiments conducted at the Imperial Institute have shown that gru-gru nuts can be shelled fairly satisfactorily by means of the nut-cracking machine made by Messrs. Miller Brothers, of 21, Water Street, Liverpool, which is referred to in the *Bulletin of the Imperial Institute*, Vol. VII (1909), p. 386 In a trial made with gru-gru nuts, 68 per cent. were completely shelled on passing once through the machine, and 8 per cent. were partly shelled.

The latter, with the remaining 24 per cent. of undecorticated nuts, were passed through the machine a second time, after which only 2 per cent. remained undecorticated and 3 per cent. partly shelled. The nuts behaved very similarly to oil palm nuts during shelling. Better results would probably be obtained after ascertaining by experiment the correct speed at which the machine should be run for decorticating gru-gru nuts.

REMARKS. 'As already indicated there is no doubt that gru gru kernels in good condition would find a ready market in the United Kingdom at prices approximating to those of palm kernels, if they can be offered in commercial quantities, i.e., in shipments of from 50 to 100 tons at a time. It is difficult to interest oil-seed crushers in products which cannot be obtained regularly in quantity, and information should therefore be furnished to the Imperial Institute as to whether it is probable that commercial consignments of the kernels could be supplied from the West Indies.

'With reference to the question as to whether it would be more profitable to export the fat rather than the kernels from the West Indies, it may be stated that gru gru fat of good quality should realize about the same price as palm-kernel oil, which is at present worth about £45 per ton in the United Kingdom (April 1913); it might, however, fetch rather less than this as it is a little softer than average palm-kernel oil. As already mentioned, however, technical trials on a large scale would be necessary in order to decide the exact value of the fat, and it would seem desirable in the first place to begin by shipping the kernels from the West Indies. The kernels alone should be exported, as the whole nuts would not be readily saleable in Europe.'

THE PREPARATION OF PLANTATION PARA RUBBER.

In continuation of the article in the last issue of the the *Agricultural News*, *Bulletin* No. 17, Department of Agriculture, F.M.S., proceeds with a consideration of the darkening or oxidation of raw rubber samples and the methods of prevention. Although colour has no connexion with strength and quality of a sample, it is stated to be an important commercial character, in that the colour of certain rubber goods may be relatively of more importance than strength. Darkening is due to the action of an enzyme, 'oxidase', and its action can be increased by some salts and inhibited by others.

Black latex is referred to first. It has been suggested that this abnormal appearance is produced by trees attacked by white ants (*Termes gestroi*), or by other pests. Observations made by the author show that the cause is not of parasitic origin, the real explanation being that the blackening is due to the presence of a high proportion in the latex of oxidizable substances. Sodium bisulphite arrests the oxidation, though the best procedure is to avoid contact with the air as far as possible by diluting the latex in the coagulating pans, and by immersing the coagulum under water. Another method of producing pale rubber is by steaming. A short treatment by this process destroys the oxidase.

Turning to the subject of moulds and bacteria on rubber, it is observed that one sample examined contained a mixture of a red organism—*Bacillus prodigiosus*—and a yellow yeast (Sarcina). Several antiseptic substances were tested, but it was found that the best method of preventing the growth of organisms is that of smoking, to be referred to later.

The action of carbon dioxide as a coagulating agent is next considered. When carbon dioxide was passed directly into latex no coagulation took place. The value of this gas, however, as an atmosphere in which to dry the rubber was found to be very great, since carbon dioxide inhibits oxidation and produces a pale rubber. It further prevents the growth of mould and bacteria. It was found that drying in the presence of the inert gas is effected more rapidly by the slightly elevated temperature when the gas is generated from burning charcoal.

Patent coagulants, dealt with in the next section, are not recommended for general use.

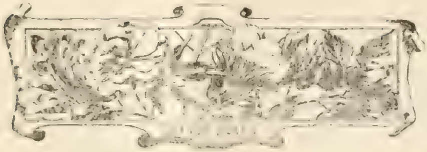
After describing certain special processes of coagulation which aim at imitating the Amazonian method of preparing fine hard Para, the author proceeds to the subject of smoked rubber and smoking houses. The most important precaution in any smoke house is to maintain the temperature below a maximum of about 110° F., since if the rubber is dried at a higher temperature, tackiness occurs and the rubber deteriorates. A thermometer—preferably a maximum and minimum thermometer—should be used in all smoking houses, and should be hung about midway up the height of one of the racks on which the rubber is suspended. Another point to remember is that the rubber should be placed in the smoke house while still wet. Prolonged smoking does not appear to alter the rubber. One further advantage of smoking is the rapidity with which the rubber dries, so that much smaller storing-room is needed on estates where smoking is carried out. Moreover, if desired, the rubber can be sent to the market in about a fortnight, or even after the elapse of a shorter period.

Two problems which will receive further investigation are the artificial smoking of rubber by the employment of creosote with the coagulant, and the question of the usefulness of vacuum driers. No conclusive results have so far been obtained in the Federated Malay States.

Dealing next with rubber machinery, it is pointed out that if two rubbers have been prepared in the same way, and one converted into 'crêpe' and the other into sheet, the latter will be found to possess superior physical qualities to the former. This is recognized by manufacturers. Rollers for 'crêpe', running at differential speeds like 3 to 1 are deprecated as being unnecessary and injurious.

Alluding again to the important matter of collecting cups, it is emphasized that the best kind to use is the porcelain or glass semi-spherical shaped one recently introduced to the market. This kind can be easily cleaned and kept clean, and although the liability to fracture has until lately been an objection to the employment of glass the recent introduction of better annealed glass renders the objection invalid. The succeeding section in the Bulletin concerns the acidity of raw rubber. In general, smoked rubbers contain the largest quantity of acid, sheet rubbers (unsmoked) being second, whilst crêpe rubbers contain the smallest amount. Therefore fine hard Para contains more residual acid than plantation, and it absorbs it from the smoke in curing. This fact is not always recognized. In the case of plantation rubber, the acid is, to a large extent, eliminated by the washing process.

After describing, in connexion with the density of latex, a useful form of hydrometer graduated in such a way that a difference of 0·016 is ranged over a stem of 3 to 4 inches in length, the author concludes with a large number of viscosity figures from which the general conclusion is drawn that with rubber from one species of tree there is a distinct relation between the viscosity curves and the physical quality of the rubber, and it is considered likely that the test may become a valuable control in the laboratory though not of much use on estates, since slight fluctuations in temperature lead to variations in the results obtained.



WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date May 19, with reference to the sales of West Indian Sea Island cotton:—

During the past fortnight, the only business in West Indian Sea Island has been a sale of 25 bales St. Kitts cotton at 20*d.*, and we report prices without change.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending May 17, is as follows:—

The sales this week consisted only of 17 bales off cotton; consequently the market has remained quiet and unchanged. We have, therefore, only to repeat our last advices, that in the absence of demand, Factors are continuing to hold for their asking prices, and to renew our last quotations, viz.:—

Extra Fine	28c. to 29c.	= 16*d.* to 16½*d.*	c.i.f., & 5 per cent.
Fully Fine	26c. to 27c.	= 14¾*d.* to 15¼*d.*	,, ,, ,, ,,
Fine	25c.	= 14¼*d.*	,, ,, ,, ,,
Extra Fine off in preparation	22c.	= 12½*d.*	,, ,, ,, ,,
Fully Fine off in preparation	18c. to 20c.	= 10½*d.* to 11½*d.*	,, ,, ,, ,,
Fine off in preparation	18c.	= 10½*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to May 17, 1913, were 961 bales, 3,951 bales, and 4,608 bales, respectively.

COTTON IN THE ST. VINCENT GRENADINES.

The agricultural conditions during 1910 in the St. Vincent Southern Grenadines, namely Canouan, Mayreau and Union Island, were described in the *Agricultural News*, Vol. IX, No. 217, pp 262 and 263. A report on a more recent visit to these islands by the Assistant Agricultural Superintendent, St. Vincent (Mr. F. Birkinshaw), has lately been received through the Agricultural Superintendent, in which is described the progress that has taken place in these dependencies during the past two years.

The report shows that considerable development has occurred, mainly, it appears, as the result of the purchase of Union Island by the Government in 1910, and the subsequent facilities offered by the Government for the sale of 'Marie Galante' and Sea Island seed-cotton on a profit-sharing basis.

UNION ISLAND. In the report abstracted in the number of the *Agricultural News* referred to above, the area of Union Island is stated to be 2,600 acres, or probably larger. According to the more recent report Union Island is 2,067 acres. At the present time there is a little over 800 acres of this area under cultivation. The crops grown are chiefly cotton, corn and pigeon peas. Last year 109,181 lb. of seed-cotton were sent to the Government ginnery, yielding 28,241 lb. of lint. Previous to the purchasing of the island by the Government, there were 320 acres under cultivation from which 13,376 lb. of lint was obtained.

During the past season seed-cotton has been bought by the Government at 2c. per lb. and the bonus subsequently paid was equal to another 2c. per lb. The total amount paid for seed-cotton was £960.

As is well known, 'Marie Galante' is the staple variety, but last year some seeds of Sakellarides Abassi, and Mitafifi cottons were sent from St. Vincent for trial. The yield from Sakellarides is very encouraging, being at the rate of 3 025 lb per acre. It is stated in the report under consideration that it is proposed to plant a larger area of this cotton during the coming season, when, besides the yield per acre, observations will be made to determine the percentage of lint to seed-cotton.

MAYREAU. Similar crops are grown in this island to those cultivated at Union. As is commonly known, the 'Metayer' system prevails, but the cotton is ginned at the Government ginnery in St. Vincent. Last season 32,019 lb. of seed-cotton were dealt with, yielding 7,862 lb. of lint. It is indicated in the report that this constitutes an increase of about 10,000 lb. on the amount produced in 1909-10, which was 22,422 lb. As in the case of Union Island, last year's crop was purchased by the Government on a profit-sharing basis.

CANOUAN. This is an island of 1,712 acres, 1,600 of which are owned privately: the remaining 112 acres are divided amongst small proprietors who send their cotton to the Government ginnery. Last season 16,247 lb. of seed-cotton from Canouan were dealt with at the Government ginnery, yielding 3,976 lb. of lint.

An interesting discovery of a new type of indigenous cotton was made by the Assistant Superintendent of Agriculture during his visit to this island. The bolls of this cotton are small, being only 15 mm. in length, the bracts being about 4 mm. longer. The seed is small and covered with 'fuzz', and the lint sparsely covers nearly the whole surface. The longest fibres are 30 mm. (1⅛ inches).

INSECT PESTS IN THE GRENADINES. It is stated in the Report that white scale (*Hemichionaspis minor*), the cotton stainer, and the leaf-blister mite were more or less in evidence in those islands that were visited. Cotton stainers are considered not to be present in sufficient numbers to do any immediate damage. Both at Union Island and Canouan leaf-blister mite was moderately prevalent. White scale was common on cotton stumps; but since the tendency at present in vogue is to cut the cotton lower than has been the practice before, there is less opportunity for the insects to find ideal shelter for their maintenance during the non growing season.

At the One Hundred and Eleventh meeting of the Council of the British Cotton Growing Association, it was stated that the cotton returns from West Africa (Lagos) amounted this year to 10,500 bales as compared with 6,902 bales for last year. As regards Nyasaland 8,055 bales were exported from the Protectorate valued at £80,550, compared with 3,392 bales for the previous year valued at £42,591. The Council was further informed at this meeting that, in regard to India, the Government of Bombay and the Bombay Millers' Association had decided to establish a buying agency for long staple cotton in Sind, and for ginning and baling and conveying the cotton to market. In connexion with the Sudan, the statements as to the crops at Tayiba and elsewhere continue to be very satisfactory. The report concludes with the information that it is proposed to hold a Cotton Trade Exhibition at Manchester in 1914.

PROBLEMS IN PROPAGATION BY CUTTINGS.

Professor Bayley Balfour, F.R.S., delivered as the eighth 'Masters Lecture', an extremely interesting and practical dissertation on the subject of propagation by cuttings. The lecture is published in the *Journal of the Royal Horticultural Society*, Vol. XXXVIII, Part 3.

Professor Balfour commenced by raising the question as to the truth of the commonly made statement that many plants cannot be propagated by cuttings. In the course of the lecture it is made evident that in the light of modern investigation this statement is unjustified. Two remarkable cases are cited early by way of illustration: one being the case of a species of Gypsophila which was formerly believed to be unresponsive to vegetative propagation, but which had been shown by the author to be easily reproduced by internodal cuttings. The second case concerned a plant of great importance in the Tropics—the bamboo—which until recently had been considered only sexually reproducible. Professor Balfour, however, has shown the bamboo to be readily increased by cuttings.

Proceeding next to general considerations of the most interesting nature concerning plants as individual organisms, it is pointed out that a plant, unlike one of the higher animals is not, strictly speaking, one individual. It is a colonial organization. 'A plant is composed of a sheet of protoplasm (living substance) stretched over a skeleton.' A limb of a plant can be removed and another will grow to replace it: if the limb of an animal be removed, only mutilation can result. A plant is therefore potentially immortal.

Two common instances of vegetative reproduction in nature were next cited—those of the Iris and the strawberry. The former plant creeps along under the soil forming new additions to its body: in fact it is an accident if the plant does not continue to live for ever. In the case of the latter example, the plant extends itself by runners—by the formation of roots near the terminal bud at the end of the prostrate offshoot.

Consideration of these two cases shows that the necessary conditions for reproduction are (a) that the young buds which give rise to the new shoot must receive ample food-supply from the parent plant until it has rooted itself; (b) that there be water to stimulate root development. These two facts are of primary importance.

After referring to the advantages that accrue to gardeners from the presence of the bulblets, corms and the like amongst monocotyledonous plants, the author proceeded to the important subject of callus formation in relation to vegetative propagation. The growth of callus consists in the formation of a mass of living cells under the stimulus of wounding. In an ordinary dicotyledonous stem or root it may take origin in the pith, in the medullary rays, in the cortex, or in the active wood cambium, and it forms lobulated projecting masses at the point where it occurs. Callus more rarely forms in monocotyledonous plants—these are content to heal wounds by a cork covering only; when it does appear, however, it arises from the cortex of the stem. Callus formation is a mark of the colonial organization of the plant already referred to. It is associated with the formation of adventitious roots.

In continuation, the lecturer proceeded to contrast the readiness with which can be propagated cuttings from soft-wooded and hard-wooded plants. The difficulty met with in the case of hard-wooded plants is explained by the fact that the absorption of water is less easily effected than in the case of soft cuttings. For other reasons, which are later referred to, resinous plants, and those rich in latex may also be difficult subjects for propagation by cuttings.

After pointing out the nature of the development of a dicotyledonous cutting, the question as to whether it is advisable to remove the leaves at the base of a cutting is referred to. It is pointed out that the practice of leaving them has these advantages: (a) the cutting is saved the healing of the wound caused by their removal; (b) the lower leaves sunk in the soil may root like the stem and aid, thereby, water absorption; (c) the lower leaves will aid in the manufacture of food for the cuttings. Another point considered was the fact that some plants propagate far more readily if the cutting be made through an internode than through a node, and vice versa. As an illustration, Clematis cannot be propagated if nodal cuttings are used, whereas internodal cuttings may be 'struck' within a fortnight. It is indicated that an investigation of the causes of such differences in cuttings is one of the problems of propagation which yet remains to be solved.

Alluding again to callus formation, the interesting and extremely important feature was noted that, however difficult it may be for a cutting to strike, yet once callus is produced, root development can always be stimulated by paring this callus.

After referring to the importance of the size of cuttings illustrated by the fact that small cuttings of hard wood plants germinate quicker than large ones, the lecturer dwelt upon the significance of resin in relation to propagation. When, for instance, cuttings are taken from coniferous trees, the shoots instead of producing callus, generally excrete resin. This flows out copiously over the surface, covering it effectively with a hard skin, thereby constituting a hindrance to the exit of young rootlets. It is necessary not only to remove this resin but to check its exudation. This can be done by plunging the cut end of the cutting in nearly boiling water. The cut resin canals are thus sealed and doubtless at the same time the heat stimulus promotes formation of callus. Dicotyledonous plants with resinous and milky juice are in like case with coniferous, and require to be treated after the same fashion.

The actual state of a shoot to be used for a cutting was another point taken for consideration. A vigorously growing shoot removed from a plant and at once placed in the nidus for propagation may fail to 'strike'. Its vigour is probably too great. The soundness of the practice of allowing some cuttings to dry slightly before planting in soil is clearly supported by this interesting feature of development.

The subject will be continued in the next issue of the *Agricultural News*.

Peripatus in Tobago.—In the *Agricultural News*, Vol. X, No. 238, p. 186, a lengthy account will be found of the genus of animals designated by the name Peripatus, a family closely related to the insects. Reference to this article will show that the Peripatus was originally described from the West Indies, by Guilding in 1826, the first specimen having been obtained from the island of St. Vincent.

Quite recently information has been received from the Smithsonian Institution of the United States National Museum, Washington, to the effect that Mr. W. E. Broadway of Tobago, has just sent an interesting specimen of Peripatus from Tobago, where these animals were not previously known to occur. It is stated by Mr. A. H. Clark, of the above institution, that the specimen represents *Peripatus (Epiperipatus) Trinidadensis*, Stuhlmann, but is probably a recognizable variety for which Mr. Clark is suggesting the name Broadwayi in a paper entitled 'Piccole, Note su degli Onychophora' now in press.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents and not to the Department.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The theme involved in the editorial in this number is the value of education as a means of contact between the planter and the scientific specialist.

On page 180 will be found an important article containing information to show that the economic value of gru-gru palm kernels is likely to prove as great as that of oil-palm seeds.

The final article on the subject of the preparation of plantation Para rubber is continued on page 181.

Information of practical value is given on page 183, in an article entitled Problems in Propagation by Cuttings.

The concluding section to the series of articles on root borers and other grubs in West Indian soils appears in tabular form under Insect Notes, on page 186.

Under the caption Veterinary Notes will be found interesting information connected with bovine tuberculosis in the West Indies, and the treatment of some common diseases of poultry.

Fungus Notes, which will be found on page 190, describe concisely the results of recent work in America on the parasites belonging to the genus Glomerella.

Greenheart in British Guiana.

The recent publication, by the United States Forest Service, of an excellent Bulletin on the characters and utilization of the Greenheart tree (*Nectandra rodiæi*, Schomb.) of British Guiana, is a matter which possesses several points of significance that should be sufficiently obvious to make enumeration unnecessary.

A great deal of interesting information is contained in this Bulletin: for instance, it is pointed out first that the extraordinary freedom from decay is due in part to the presence in the wood of an alkoloid known as biberine, and in part to the presence of resinous substances known as tyloses. As might be expected, the black variety of timber is the most durable on account of the abundant development of tyloses to which the dark colour testifies.

Practical evidence of the durability of the wood is evinced by the employment of greenheart in the construction of the lock gates in the Manchester Ship Canal, and recently, at Panama. Wood used in the gates of the Canada Dock, built in 1856 was employed again in their reconstruction in 1894. Nansen's ship *The Fram*, and the Antarctic ship, *Discovery*, were constructed of greenheart.

As regards physical characters, greenheart has a specific gravity of 1·08 to 1·23 or about 75 pounds per cubic foot. (One cubic foot of water weighs 62·425 lb.) The wood has a crushing strength of 12,000 lb. per square inch, 65 per cent. greater than that of English oak. One disadvantage of greenheart is that it shows some tendency to split and cleave, and has to be worked with great care.

In referring to substitutes for greenheart, mention is made in the Bulletin, of white cironaballi (*Nectandra surinamensis*, Mes.), to African greenheart (two species of leguminous trees that grow on the West Coast), to the East African greenheart (*Walburgia ugandensis*), to ironwood (*Colubrina ferruginosa*, Brongn.), and to various other trees in the West Indies. None of these, however, occur to a large enough extent, nor are sufficiently durable, to form a perfect substitute for the greenheart of British Guiana.

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More Organic Soil Constituents.

It may be remembered that modern theories concerning soil fertility were described at some length, editorially, in the *Agricultural News*, Vol. XI, Nos. 266 and 267, where reference was made to the well-known investigations of the Bureau of Soils of the United States Department of Agriculture on organic soil constituents and their effect on fertility. In view of the continuation of the work, the results obtained may be briefly recapitulated. Whitney, Schreiner and others having isolated a large number of complex organic compounds from the soil, proceeded, by means of water cultures, to test the effect of each upon the growth of wheat seedlings. Some of these compounds, for instance dihydroxystearic acid, were found to have a distinctly deleterious action, whilst others, for example, creatinine, were shown to be beneficial, the particular compound just mentioned being found to be fully as valuable for plant nutrition as nitrates. These results, in respect of their application to problems of soil fertility, were criticized by the Rothamsted investigators who stated that their experiments provided no evidence to show that, in the soil itself, these organic compounds exerted the influence observable under the artificial conditions of water-culture, except, in the case of sour soils, lacking in calcium carbonate. The American work has been continued, and in Bureau of Soils Bulletin No. 74, the results are summarized by Schreiner and the importance of the subject in connexion with soil fertility is maintained: recently, also, Bulletin No. 88 has appeared, in which E. C. Shorey claims to have identified fourteen new organic compounds, making up the total number to thirty-five. These have been classified as follows: thirteen organic acids, nine organic bases, three sugars, two aldehydes, two alcohols, and one each: hydrocarbon, glyceride, resin ester, sulphur compound, phosphorus compound, and an acid anhydride. Optimistic views are expressed that modern methods of research will, in time, lead to the determination of all the organic compounds of the soil.

Without an expert acquaintance with the subject, criticism has to be guarded, but it would seem that the more profitable line of work might lie in an investigation of the stability of these compounds in the soil. They are essentially decomposition products of organic matter and their existence must be closely connected with biological changes: they may therefore be considered as continually undergoing transformation.

The latest development of considering these compounds in relation to partial sterilization (see *Agricultural News*, Vol. XII, pp. 84, 123, 137) will be dealt with in these columns in due course.

Rubber-vine Cultivation in the Bahamas.

It is mentioned in the *Journal of the Royal Society of Arts* for April 1913, that an extensive cultivation in the Bahamas of the rubber vine *Cryptostegia grandiflora* is in contemplation. It is understood that approximately 5,000 rubber vines will be planted to the acre. After six months' growth the rubber vine is said to attain a length of 12 to 30 feet. The vines will be cut in about twelve months, when there will be presumably about 2lb. of shrub to the plant as a minimum, yielding about 2 per cent. of rubber, or 200 lb. to the acre. According to the American Consul at Nassau, a large number of shoots to be planted in the Bahamas have been ordered from Mexico, and special machinery for extracting the rubber and fibrous by-products by a secret process has been ordered from the United States.

The rubber juice is contained chiefly in the lactiferous ducts of the bark, but to some extent also in the wood of the stem—in fact, the entire plant contains a certain amount of rubber. While the process of extraction is secret, yet in the main, it appears that it is analogous to the production of sugar from the sugar-cane.

The fibrous by-products of the rubber vine are considered as possessing an importance possibly greater even that of the rubber itself. The bark of the vine yields 6 per cent. of the weight of the whole stem, and is a pure cellulose fibre, having a silky lustre comparable to Japanese ramie fibre and almost equal to cotton. It is thought that it can be used as a substitute for Egyptian cotton, especially in the manufacture of fine underwear and other articles. The pods of the vine besides containing a fair percentage of juice, have large quantities of silky cotton such as would be suitable for stuffing pillows; when refined and specially treated, it can be successfully spun with ordinary cotton. The woody substance of the vine, when bleached and worked out, yields a fibre suitable as paper pulp. The vine can be best harvested after the fruiting period.

Further information regarding this plant, which is commonly known in Mexico under the names Clavel Aleman and Clavel de España, may be obtained on reference to the *Agricultural News*, Vol. X, p. 315.

Agriculture in St. Lucia.

Information concerning the agricultural industries in St. Lucia during 1911, is presented in *Colonial Reports*—Annual, No. 752, which has recently been issued. From this the following details are here abstracted.

Sugar and cacao remain the principal products of the Colony, but lime cultivation is making satisfactory progress and promises to become of very considerable importance. A fairly large area is already planted up which should soon reach the bearing stage, and cultivation is being rapidly extended. This industry is also attracting the attention of small growers.

From a table recording the quantity and value of the export of sugar and cacao during the past five years, it is gathered that 4,288 tons of sugar valued at £52,535 was exported in 1911, as against 5,199 tons value £64,988 in 1910; whilst of cacao the figures for the similar years are 10,368 bags (of 220lb.) value £46,656, and 8,187 bags value £40,935, respectively.

The Agricultural Superintendent (Mr. J. C. Moore) reports that the smaller output of sugar in 1911 is attributable to the very heavy rainfall of that year, which caused damage by flood, and also made it impossible to carry out proper tillage and weeding operations, besides water-logging the soil and thus checking the growth of the canes. As regards cacao, there has been some small extension of the area planted, and the methods of cultivation have received attention.

The planting of coco-nuts is being taken up in St. Lucia, and there is no doubt scope in the island for a very profitable extension of this cultivation. Cotton has not proved a success, and only a very negligible quantity was grown during the year.

Fifty-one grants for Crown lands were issued during 1911, the area disposed of being 421 acres. The price of such land is at the rate of £1 per acre, payable one-fifth on application and the rest in four annual instalments. It may be added that sixty-nine new applications for land were filed.

INSECT NOTES

ROOT BORERS AND OTHER GRUBS IN WEST INDIAN SOILS.

The following tabular diagram serves to summarize the chief points in regard to the classification, distribution, life-history and parasitism of the more important root borers and other grubs of West Indian soils. It is intended as an assistance to the memory, and as a partial index to the contents of the preceding articles on the subject:—

RHYNCHOPHORA.

NAME.	DISTRIBUTION.	LARVA.	ADULT.	PARASITE.
Diaprepes abbreviatus.	Barbados, St. Lucia, Dominica.	Root borer of cane. Also known to attack roots of limes and other plants.	Feeds on leaves of corn and canes.	——
Exophthalmus esuriens.	Leeward Islands.	Root borer of canes.	Feeds on leaves of limes and plants.	——
Prepodes vittatus.	Jamaica.	Root feeder on orange.	——	*Elis atrata*
Diaprepes spengleri.	St. Vincent, Porto Rico.	In Porto Rico, feeds on roots of orange, guava, avocado, mango and rose.	Feeds on leaves of young orange trees in Porto Rico.	——
Diaprepes sp.	Montserrat.	——	——	——
Diaprepes sp.	Virgin Islands.	——	——	——

SCARABEIDAE.

MELOLONTHIDAE.

Phytalus smithi.	Barbados, Mauritius.	Root trimmer of canes.	Eats leaves of various plants.	*Tiphia parallela*
Lachnosterna patruelis.	St. Kitts, Dominica.	In soil of sugar-cane fields.	——	Parasite grub has been found, but adult not known
Lachnosterna sp.	Antigua	In soil of sugar-cane fields.	——	——
Lachnosterna sp.	Porto Rico.	Root trimmer of canes, attacks roots of orange, trimming young roots and often girdling the tap root.	Leaf feeder on orange, etc.	——
Lachnosterna patens.	St. Vincent.	——	Feeds on cacao leaves.	——

DYNASTIDAE.

Ligyrus tumulosus.	West Indies.	Scavenger.	——	*Dielis dorsata*
Tomarus bituberculatus.	Dominica, St Lucia.	Feeds on roots of banana.	Tunnels into base of banana suckers.	——
Strategus titanus.	St. Croix, Jamaica, Porto Rico, Virgin Islands.	Feeds on roots of canes and tunnels into base of cane stalk.	——	——
Strategus anachoretus.	Trinidad.	Same as *S. titanus.*	Tunnels into base of young coco-nut trees.	——
Cyclocephala tridentata.	Dominica, St. Lucia.	——	——	——
Cyclocephala dimidiata.	Grenada.	——	Eats flowers of cotton.	——
Cyclocephala vincentae	St. Vincent.	——	Eats leaves of plants.	——
Leucothyreus vincentae.	St. Vincent.	——	Eats leaves of plants.	——
Leucothyreus sp	St. Lucia.	——	Eats leaves of cacao.	——
Dyscinatus barbatus.	Barbuda, St. Kitts.	——	In Barbuda, tunnels into cane plants.	

VETERINARY NOTES.

BOVINE TUBERCULOSIS IN THE WEST INDIES.

The information contained in this article has been abstracted from a report by the Veterinary Officer of the Imperial Department of Agriculture (Mr. P. T. Saunders, M.R.C.V.S.), on the results of tests for tuberculosis among cattle in Antigua.

The investigation was concerned mainly with the tuberculin test, the essential feature of which is the injection into the animal of a certain serum. If the animal experimented on is tuberculous, the operation gives rise to temporary fever. One hundred and sixty animals were tested in these trials, and 23·1 per cent. were shown to be suffering from the disease. It is a point of some interest, that out of twenty-five of these animals which were suspected as being tuberculous, seventeen were reactors; though a matter of still greater significance is the fact that, of the 135 animals which possessed no physical signs of the disease, twenty-three were found by the test to be tuberculous. This, of course, is important, since it shows that an animal may have tuberculosis without exhibiting any of the external symptoms of the disease.

Several interesting observations were made in the investigation as regards peculiar local symptoms. In many cases, in infected animals, a mass of huge size was found covering the entire neck and shoulder of the animal; in some instances the growth existed instead, of many small swellings, each not bigger than a walnut, situated at more or less regular intervals. These small swellings were found to be lymphatic glands affected with tuberculosis, and the large masses were the result of coalescence of the small ones. On several occasions the presence of tubercle bacilli was demonstrated in these abscesses. Another glandular swelling commonly found in reactors, and in others too, was that of the precrural lymphatic gland, situated in the flank immediately in front of the stifle-joint. In healthy animals this gland is smaller than a man's thumb, but when diseased may reach 9 or 10 inches.

An important part of Mr. Saunder's report is devoted to a consideration of means for the prevention and suppression of tuberculosis. It is emphasized that in any attempt to eradicate the disease, it is first necessary to know the extent to which it occurs: the tuberculin test was devised originally as a means to this end. The extent having been ascertained, the method of procedure will depend upon the percentage of positive reactions in the flock. Wholesale slaughter of affected animals is not advocated. The two generally accepted systems which may reasonably be applied in the work of eradication are: (1) Professor Bang's system—useful when a small percentage of animals (say 15 per cent. or less) is affected; and (2) the Ostertag system—valuable where a large number is diseased.

The essential feature of the Bang system is that the reactors and the healthy cattle are kept entirely separate on the estate. Under no conditions are they allowed to come into contact; neither in work nor in feeding. The same cattle minders are not allowed to look after the flocks, but different men are employed for each. Whenever a calf is born among the reactors it must at once be taken from its mother, and either put to a healthy cow or brought up by hand. Tuberculosis itself is not hereditary, but susceptibility is.

It will be evident that the Bang system allows affected animals to be made use of while the new sound flock is being built up. Financial loss by the adoption of such a method as this is therefore reduced to a minimum.

As previously indicated, the Ostertag system concerns flocks where approximately half the number react to the test. The method is to treat the whole flock as being diseased, and to build up the new and healthy flock by starting only with the new-born calves which are reared on pasteurized milk. (Pasteurization consists in intermittent heating at a temperature somewhat below boiling point.) The tuberculin test is applied to the animals at the age of six months and reactors are transferred to the affected flock.

From what has been said regarding these systems and the extent of tuberculosis in Antigua, it will be apparent that the Bang system offers the more convenient lines along which to eradicate the disease. In making recommendations for local application, it is pointed out in the report that the greatest care must be taken when breeding from infected animals: diseased bulls should be castrated and used as working oxen; affected cows, that is, those cows which are not clinically affected, may be bred from, but their calves should at once be removed from the source of infection. It is better to work diseased cows in the yoke than to employ them for the production of pen manure, which is one way of spreading tuberculosis.

A most important matter of a general nature in connexion with the eradication of tuberculosis is the system of feeding the animals. Poor feeding lowers natural resistance. Where animals are fed on molasses 'wash' and oilmeal, from one large vessel, as is frequently done on estates, a diseased animal will discharge infective material into the food which the healthy animal is consuming. In dry weather, when fodder is scarce and the animals are in low condition, this particular form of feeding is very common, and hence the chances of infection under these conditions are obviously very great.

Mr. Saunders concludes his report with references to the disadvantages of overcrowding, and to the importance of keeping the floors of cattle pens and sheds as clean as possible, in view of the fact that the germs of tuberculosis are found normally in the excreta of diseased animals.

Acknowledgement is made of the assistance rendered by the Government of the Leeward Islands, and by the planters on whose estates the tests were carried out.

Treatment of Common Disease of Poultry.—Useful hints as regards the treatment of common ailments of poultry are contained in Farmers' Bulletin 528 of the United States Department of Agriculture. In this it is stated first that all birds showing signs of any specific disease should be isolated. Colds and roup in poultry should be dealt with by disinfecting the drinking water as follows: to each gallon of water add the amount of potassium permanganate that will remain on the surface of a dime. As regards gapes, it is said that new ground and vigorous cultivation will often remedy this trouble. Scaly legs is dealt with by the application to the affected parts of vaseline containing 2 per cent. of creolin, after which they are soaked for twenty-four hours in warm soapy water. The treatment must be repeated until the animal is cured. Intestinal troubles in chicks are treated by the administration of well-boiled rice mixed with a little charcoal, and also by dissolving 15 grains of crude catechu in each gallon of drinking water. For canker, the sprinkling of a little flowers of sulphur in the mouth and throat of the bird, and the addition of some chlorate of potash to the drinking water is recommended.

GLEANINGS.

One of the latest publications of the United States Department of Agriculture is a large scale map showing the quarantine for Texas fever of cattle in that country. The publication should be useful to those who anticipate either importing or exporting animals to this part of North America.

The exports from Sicily of citrate of lime for the months December 1912, January and February 1913 were, the United Kingdom 354,509 kilos., to the United States 527,760, to France 275,853, to the Netherlands 202,512, to Austria 70,429, to Germany 9,821. (From *The Board of Trade Journal*, May 1913.)

It is stated in the *Review of Applied Entomology* for April 1913, that a useful method for exterminating flies is to expose a mixture of formalin, milk and water in shallow plates, or what is better still, to sprinkle the mixture about a room in tiny drops of ¼-inch to 1 inch in diameter. In this state the fly readily drinks it. The method has been used with great success in India.

The reaping of the cane crop in St. Kitts is being rapidly carried on in the Basseterre district. The Central Factory results this year are very satisfactory, the condition of the canes being superior to that of last season The Agricultural Superintendent reports an average yield of about 18 tons per acre. The young cane crop is well advanced and healthy.

A communication received from the Agricultural Instructor, Nevis, states that the cane crop in that island is now almost reaped. The returns continue to be very poor, and the young canes throughout the island are suffering from want of rain. The cotton lands are nearly all prepared, and a few acres were planted towards the end of April, but these have all died from the effects of drought.

Manganese sulphate has on some occasions been found useful as a fertilizer. Applications at the rate of about 100 lb. to the acre have been found to stimulate the growth of rice. The useful effect of manganese on plant growth is due most probably to its oxidizing activity, and its influence upon the oxidizing power of plants, micro-organisms and soil. (From *Circular* No. 75, Bureau of Soils, United States Department of Agriculture.)

An editorial in *Tropical Life* for April 1913, calls attention to the scarcity in the supply of soya beans. It would appear that this is partly the outcome of Eastern and Western competition. A large supply is required by Manchuria which has been met from the same sources as those on which the industry in Great Britain is dependent. It is suggested in the article that strenuous effort should be made in British colonies to extend the cultivation of soya beans.

According to information received from the Curator of the Botanic Station, Dominica, the green lime trade with that Presidency during April was very active. Prices ranged up to the abnormally high figure of 25*s* per barrel, unpacked in Roseau. Applications have been received at the Agricultural Department for over 35,000 lime plants in response to an offer of 25,000. In regard to cacao, a considerable amount of die-back is reported, which is believed to be the indirect effect of the high winds experienced since Christmas.

It is predicted in *Diplomatic and Consular Report* No. 5047—Annual Series, that the competition of Hawaii will probably be felt in the West Indies, particularly as regards pine-apples, bananas and other fruits, coffee, tobacco, cotton, sisal fibre and rubber. An exceptional economic condition obtains in Hawaii in connexion with the fact that the population is so small that an unusually large percentage of directly consumable produce is able to be exported. Hawaii also possesses the advantage of free commercial entry into the United States.

The Annual Report of the Inspector of Schools on Elementary Education in Trinidad, for the year 1911-12, contains interesting remarks on the teaching of agriculture and nature study. The suspension of local school garden shows appears to have had a dispiriting effect on teachers, and energies have been relaxed in regard to outdoor practical work. On the other hand, the theoretical studies appear to be very satisfactory, and an encouraging sign is the largely increased interest that is being taken in collecting specimens for the school museums.

The effect of earthworms on the fertility of the soil is referred to in the *Experiment Station Record* (Vol. XXVII, No. 6). It is stated in this that investigations carried on by the British Government in the valley of the White Nile in the Sudan, indicate that the great fertility of the soil in this valley is largely due to the work of earthworms. Worm castings formed during a period of six months weighed 239,580 lb. per acre. Other observations in Upper Egypt indicate that the castings there amounted to 58,785 lb. during the same six months

Information has recently been received from the Cambridge University Press to the effect that there will be published shortly a book entitled Rubber and Rubber Planting, by Dr. R. H. Lock, Assistant Director of Agriculture, Ceylon. It deals with the history of the use and cultivation of rubber, its botanical sources, the physiology of rubber and latex, the diseases, chemistry and manufacture of rubber, and with rubber planting. The work is likely to appeal to manufacturers, planters, botanists and botanical students, and to the general public interested in rubber.

STUDENTS' CORNER.

JUNE.

First Period.

Seasonal Notes.

The fields of plant canes are now mostly reaped, and this condition affords opportunity for the study of several problems of interest. Regard the fields critically. Has the cutting of the canes been done thoroughly? Note the weeds that are growing, and pay great attention to their habits of growth and the ways of reproduction; for these matters are of more importance than names and the mere shape of leaves, flowers and stems. Distinguish carefully, in the first place, between annual and perennial weeds. Remember that it is as important to keep the headlands of fields weeded as the fields themselves, since waste areas provide a source of infection. Many weeds may also harbour insect and fungus pests.

What tillage should the fields of cut canes receive? As regards the manuring of ratoon canes, the Report on Sugar-cane Experiments in the Leeward Islands, 1911-12, should be read, in which publication will also be found a great deal of important information on the characters of the different varieties of sugar-cane that have just been, and are still prominently before those interested in sugar-estates.

Careful attention will be given, of course, to the article in this issue on the manufacture of syrup.

A good supply of bamboo and other pots and seed boxes should be got ready for sowing seeds of cacao, coffee, rubber, nutmeg, mango and other useful trees and plants as soon as the rains come in. Nursery beds should be well forked, manured and prepared for transplanting seedlings. Pots of seedling cacao and mango should be carefully attended to in order to have good growing stocks for grafting. Seeds of any useful forest and other tree should be collected.

In regard to the planting out of lime seedlings, a dull day following heavy rains is the most suitable climatic condition under which to carry out the operation. This holds good, in fact, as regards all transplanting. It is commonly the practice for the lime plants to be cut back before being planted out, thereby removing all the young shoots and the bulk of the leaves. Is it always advisable to remove the leaves? If the roots have been properly pruned in the seedling beds little root pruning will be necessary at this stage. See that the roots are well spread out and that the soil is firmly pressed down around them. The land should be kept free from weeds.

On some of the lime trees on different estates, a good deal of trouble is occasioned by the presence of Dodder (*Cuscuta* sp.), and Mistletoe (*Loranthus* sp.). Find out by direct observation how these two plants obtain their food-supply, how they reproduce themselves, and the manner in which they become distributed.

In connexion with the cacao crop, the final pickings are being made in many places, and the yields of trees which have received different treatment, or which have been growing under different conditions should be noticed as far as possible.

An important investigation is described under Fungus Notes in this number of the *Agricultural News*. In order to refresh the student's memory, the following figures have been reproduced, which will show him the difference between a spore called a conidium, and a spore denominated ascospore. In point of fact, Fig. 7 represents a thin section of plant tissue with the fructifications of a Colletotrichum bursting through the epidermis or skin. The detached cells constricted in the middle, are conidia. The cells in Fig. 7 (and also in Fig. 8) are of course greatly magnified. An ascus containing eight ascospores is seen in Fig. 8. This ascus has been removed from its position on the fungus body. The differences, other than shape and size, between conidia and ascospores are: (1) that ascospores, unlike conidia, are supposed to be the result of sexual reproduction (sexual union), and (2) that ascospores are more resistant and remain quiescent for a longer time than conidia. Chlamydospores are particularly resistant spore bodies of non-sexual origin. They are generally extremely small and covered with a thick coat.

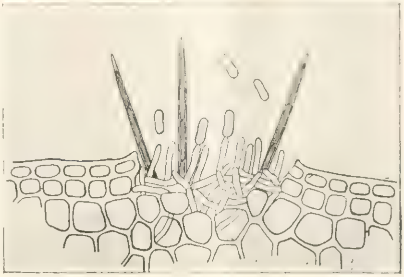

Fig. 7. Section showing Conidia.

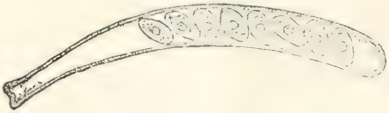

Fig. 8. Ascus containing Ascospores.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What manures are applied in practice to ratoon canes? What do they contain, and at what rate per acre are the applications made?

(2) Can Bengal beans be employed as a foodstuff? If so, why?

INTERMEDIATE QUESTIONS.

(1) Contrast the mode of living as exemplified by the Dodder (*Cuscuta* sp.) and *Marasmius sacchari*.

(2) Write a short description of Zapupe fibre.

FINAL QUESTIONS.

(1) Give a short account of the recent prices of sugar and green limes. Endeavour to explain the causes of any abnormalities.

(2) Mention ten useful hints in connexion with the preparation of plantation Para rubber.

FUNGUS NOTES.

RECENT WORK ON THE PARASITES BELONGING TO THE GENUS GLOMERELLA.

Of recent years problems in mycology have been regarded from a much wider point of view than was formerly the case. Particularly is this so in respect to that branch of the subject known as parasitology. As an illustration of this new phase, the work of Shaw in India on Rhizoctonia may be cited, and as a still later example, may be mentioned the recent work on the parasites of the genus Glomerella, conducted by C. L. Shear and Anna K. Wood of the United States Department of Agriculture. A complete account of this latter investigation has just been published as *Bulletin* No. 252 of the Bureau of Plant Industry, and from this interesting and important paper most of the information in the following article has been abstracted.

The name Glomerella is applied to the ascogenous forms of Glœosporium or Colletotrichum—form-genera of the fungi imperfecti, the parasitic nature of which is well known in the West Indies. The objects of the work under review were to study the production of the ascogenous stages, and to determine the habits and identity of the numerous forms of Glœosporium and Colletotrichum found upon the same hosts, and upon different hosts. The method of study adopted was to observe the behaviour of the different forms in the moist chamber and in pure culture, and to carry out a large number of cross inoculation tests to find out whether a so-called species of Glomeralla found on one host, say on the cotton plant, could infect another host, say the avocado, on which a supposed different species of Glomerella was regarded as being individually parasitic. Apart from its general interest, the economic value of such an investigation is readily apparent.

With particular reference to the life history of Glomerella it is important to understand that until recently, the two principal spore forms, conidia and ascospores, have been described and treated as distinct organisms. As is already pointed out, the conidial forms are well known under the name of Glœosporium or Colletotrichum. The essential feature of the work under review is that ascospores, conidia and chlamydospores or appressoria (resting spores) are shown to be normal stages in the life-history of the genus. These facts greatly simplify the generic classification of the forms.

In regard to the thirty-six hosts—of which the names of some are given later—that have hitherto been considered as being attacked by thirty-six different species of Glomerella, it has been found that neither morphological nor physiological differences can be observed which are sufficiently constant to be regarded as specific characters. All the different forms have been referred by the authors to three species of Glomerella: *G. cingulata* which occurs on thirty-four of the hosts, *G. gossypii* on one (namely, cotton), and *G. lindemuthianum*, on one.

G. cingulata is exceedingly variable in all its characters. The cause of this variability is not yet clear. The essential point about this fungus is that it can often be found to grow from apparently healthy tissue, which has been washed in corrosive sublimate. The explanation is that the chlamydospores send a germ tube down through the epidermis of the host plant, which lies quiescent until the plant becomes weakened from some physiological cause, when the fungus begins to develop as a vigorous parasite.

It is stated by the authors: 'Inoculation experiments with fruits have shown that most of the forms from different hosts will produce the characteristic Glomerella rot on fruits of other hosts. It is also shown that there is a great variability in the virility of different races or strains of the fungus from the same host. In one experiment races from the lemon, grape and fig produced more serious cases of bitter-rot of apple than a race of the fungus derived from apples. These facts are of great importance in connexion with the selection and production of disease-resistant varieties of plants.'

It may be added, further, that this is of immense importance in regard to mycological legislation, in view of the fact that the disease can apparently spread as easily from temperate countries to the Tropics, as within the Tropics itself. It must also be remembered that *G. cingulata* can also be carried by any one of thirty-four different species of agricultural plants, including such diverse forms as palms, oranges, apples, gooseberries, cacao and arrowroot. Of great economic significance is the fact that one species of Glomerella is confined to cotton. This species, it may be added, occurs in the West Indies and causes the well-known disease, anthracnose.

The production or non-production of the perithecial stage of Glomerella appears to be a fairly well-marked hereditary race character. There is no evidence to show that the production of perithecia is controlled by any of the ordinary conditions of nutriment or environment, though accurate investigation along this line would possibly lead to results of great importance

In conclusion, the methods of controlling Glomerella may be briefly summarized as follows: (1) spraying with Bordeaux mixture; (2) selection of fungus-free seed—particularly valuable in the case of cotton; (3) eradication and destruction of dead and diseased parts of infected plants.

The selection and breeding of resistant varieties may also be practicable in some cases.

ANNUAL REPORT ON THE ROTHAMSTED EXPERIMENTAL STATION, 1912.

In the introduction to this publication, compiled by Dr. E. J. Russell, Director of the Station, mention is made first of the fact that the Rothamsted Experiment Station was established in 1843 by the late Sir John Bennett Lawes. The institution has never been connected with any external organization, and it has until recently been maintained entirely at the cost of its founder. By the provision of the Trust Deeds, the management is entrusted to a Committee nominated by the Royal Society, the Royal Agricultural Society, and the Chemical and Linnean Societies and the owner of Rothamsted. During recent years several grants have been made from various sources including the grant of £1,000 by Mr. J. F. Mason, M.P., for the building and equipment of a bacteriological laboratory; £10,000 given by the Goldsmith Co., the income of which is to be devoted exclusively to the investigation of the soil: by the Permanent Nitrate Committee, a grant of £2,000 has been made. Finally, after several further contributions from private sources, the Government has contributed an annual grant of £2,500, and a further grant of £3,000 from the Development Fund for the purpose of extending the Rothamsted plot experiments.

The Rothamsted Experiment Station is recognized as the institute, in Great Britain, for dealing especially with soil and plant nutrition problems. Scholarships have recently been instituted to provide the training and research work unobtainable at the Universities, and advantage is frequently taken of Rothamsted by investigators from other institutions who require a special knowledge of methods in agricultural chemistry.

The field experiments, which were begun in 1843, have on some of the plots been continued without break or alteration up to the present day—for seventy years; it is impossible to exaggerate the importance of continuing these experiments without any change, as nowhere else in the world do such data exist for studying the effects of season and manuring upon the yield and quality of the crop, and for watching the progressive changes which are going on in the soil. The maintenance, however, of the old data throws a heavy burden on the Experiment Station. There are 210 plots, and every year 243 samples have to be taken with proper precaution and put into store for future reference. In addition, there are made 486 determinations of dry matter, 243 of ash, 170 of nitrogen, fifty of phosphoric acid, and twenty-four of potash, also 180 determinations of nitrates, etc in rain and drainage waters, and seventeen botanical analyses of hay. This does not include examinations of soil, the complete grass separations, and other extensive series of determinations which are made at longer intervals. All the above determinations, however, are part of a necessary routine which must be completed before any new investigations can be undertaken.

It should be remembered that the object of the Rothamsted experiments is to ascertain how the plant grows, and only indirectly to find the most paying methods in which to provide nutrients for cultivated plants; hence neither the nature nor the quantity of material applied is to be taken as indicating the manures which should be used in practice

It may be added in concluding this abstract of the introduction to the report, that the benefit derived from Rothamsted is not merely confined to British or even to European agriculture, for the results of abstract research are frequently of the greatest value in directing and in interpreting the results of soil investigations in the Tropics, and in many cases the results of special investigations at Rothamsted are directly applicable under tropical conditions.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

The Report of Mr. J. R. Jackson is as follows:—

Little or no improvement can be reported on the general condition of the markets during the month of April. The supplies were normal, but the demand slow. Amongst West Indian products mace, nutmegs and lime oil commanded slightly higher prices.

GINGER.

At the first spice auction on the 2nd of the month, ginger was represented by 100 packages of Cochin, which were sold without reserve at the following rates: limed Calicut 40*s.*, and brown rough 30*s.* to 31*s.* per cwt. A week later 631 bags of washed rough Cochin were offered, and bought in at 31*s.* to 32*s.* At auction on the 16th, Jamaica was represented by 110 packages which sold at the following rates: fair to good common 45*s.* 6*d.* to 49*s.* 6*d.*, and bold middling 53*s.* to 53*s* 6*d.*. Some 239 bags of washed rough Cochin were offered and bought in at 33*s.* per cwt. On the 23rd no Jamaica was offered, but cochin was represented by 631 bags, a small part only finding purchasers, 37*s.* being paid for cut tips, and 35*s.* for brown cuttings; some sales were also effected for rough brown Calicut at 30*s.* to 31*s.* per cwt. Good small cut Calicut was bought in at 45*s*; at auction on the last day of the month the offerings were small and no sales were effected

NUTMEGS AND MACE.

At the first sale on the 2nd of the month, 64 packages of West Indian nutmegs were brought forward and partly sold, 84's to 91's fetching 5½*d* to 5¾*d.* per lb., 102's to 111's 5½*d.* to 5¾*d.* On the 9th, 277 packages of West Indian were offered and sold at the following rates: 75's to 85's, 6*d.* to 6½*d.*; 88's to 98's, 5¾*d.* to 6*d*; 114's to 124's, 5½*d.* to 6*d.* Again at the auction on the 16th, 9 packages of West Indian were offered and sold at similar rates; 60 packages of limed Eastern were also sold, 55's fetching 9½*d.*, 68's 7*d.*, 80's 6½*d.* and 98's to 106's, 5½*d.* to 5¾*d.* At the two concluding sales in the month similar prices ruled, 46 packages of West Indian being sold at one and 14 packages at the other, respectively. For mace there has also been a steady demand. At auction on the 9th, 95 packages of West Indian were brought forward most of which were sold, fair mixed to pale fetching 2*s.* 4*d.* to 2*s.* 7*d.*, ordinary and red 2*s.* 2*d.* to 2*s.* 3*d*, and broken 1*s.* 9*d.* to 2*s.* 2*d* per lb. On the 16th, the offerings consisted of 6 packages of West Indian and 20 packages of Eastern; the former sold at 2*s* 2*d.* to 2*s.* 4*d.* and 2*s.* for broken, whilst for the Eastern 2*s.* 3*d.* to 2*s* 5*d.* was obtained. At the last sale there was a continued steady demand, 3 packages of West Indian selling at 2*s.* 7*d.* for good pale, and 2*s.* 2*d.* to 2*s.* 3*d.* for dark red and pickings.

SARSAPARILLA.

The month commenced with an increased demand for grey Jamaica, which was represented at the first drug auction on the 3rd of the month by 17 bales, and of native Jamaica 8 bales. The whole of these were sold, the former at an advance of from 3*d.* to 4*d* per lb., fair fibrous realizing from 2*s.* 8*d.* to 2*s* 9*d.* per lb. Of the native Jamaica, 1*s.* to 1*s.* 1*d* was paid for dull red to fair red, in part mouldy. At auction on the 17th no grey Jamaica was offered, but native Jamaica was represented by 15 bales and Lima Jamaica by 5. Of the former 12 bales were disposed of, 9 of which realized, from fair to good red, 1*s.* to 1*s.* 1*d.* per lb., 11*d.* to 11½*d.* being paid for fair red, and 8*d.* to 10*d.* for dull mixed tawny. Two bales only out of the 6 offered, found buyers, and these 2 fetched 2*s* 8*d.* per lb.

CASSIA FISTULA, KOLA AND LIME OIL.

On the 3rd of the month 8 baskets of Cassia Fistula, fair thin fresh pods from Java, were sold without reserve at 23*s.* Kola continues scarce and dear. At auction at the beginning of the month one bag of fair dried West Indian halves, part mouldy, realized 4*d.* per lb., and a week later a few bags of fair dried were offered at 5*d.* On the 17th, at auction, 42 bags from Java were brought forward, 36 of which sold at from 4¼*d.* to 4¾*d.* per lb. They were of ordinary dullish halves, partly broken. About the middle of the month two cases of hand pressed West India oil of lime were offered and sold at 11*s.* 6*d.* to 11*s.* 7*d.*, and 4 cases of distilled yellow to pale were sold at 1*s.* to 1*s.* 2*d.* per lb.

Cotton growing in the Dominican Republic is referred to in a recent issue of *The Board of Trade Journal* (April 24, 1913). Great expectations were formed of the results of a trial to grow Sea Island cotton under irrigation, though political disturbances apparently interfered. Cotton gins are in operation at Puerto Plata and Monte Cristi, and samples of Sea Island cotton grown near Barahona have been valued at 11*d.* to 1*s.* per lb. by Liverpool experts.

MARKET REPORTS.

London.—The West India Committee Circular, May 20, 1913; Messrs. E. A. de Pass & Co., May 9, 1913.

Arrowroot—3¾*d.* to 5*d.*
Balata—Sheet, 2/9½; block, 2/- per lb.
Beeswax—£8.
Cacao—Trinidad, 70/- to 79/- per cwt.; Grenada, 64/6 to 69/-; Jamaica, 62/- to 68/-.
Coffee—Jamaica, 72/- to 74/-.
Copra—West Indian, £28 10*s.* to £29 per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 20*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet. 38/- to 62/-.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 1/6 to 1/8; concentrated, £24 10*s.*; otto of limes (hand-pressed), 12/3.
Logwood—No quotations.
Mace—1/9 to 2/9.
Nutmegs—5¾*d.* to 6*d.*
Pimento—2⅛*d.* to 2⅜*d.*
Rubber—Para, fine hard, 3/9¼; fine soft, 3/8; Castilloa, 3/ per lb.
Rum—Jamaica, 2/3 to 6/- per gallon.

New York.—Messrs. Gillespie Bros. & Co., May 16, 1913.

Cacao—Caracas, 14c. to 15c.; Grenada, 14c. to 14¼c; Trinidad, 13⅞c. to 14⅜c; Jamaica, 12c. to 13¾c.
Coco-nuts—Trinidad and Jamaica, selects, $38·00 to $40·00; culls, $25·00 to $26·00 per M.
Coffee—Jamaica, 12c. to 14½c. per lb.
Ginger—8¼c. to 10½c. per lb.
Goat Skins—Jamaica, 52c.; Antigua and Barbados, 48c. to 50c.; St. Thomas and St. Kitts, 44c. to 46c. per lb.
Grape Fruit—Jamaica, $2·75 to $4·00
Limes—$11·75 to $12·50
Mace—50c. to 57c. per lb.
Nutmegs—110's, 12c.
Oranges—Jamaica, $2·50 to $3·50 per box.
Pimento—4⅛c. to 4¼c. per lb.
Sugar—Centrifugals, 96°, 3·33c. per lb.; Muscovados, 89°, 2·83c.; Molasses, 89°, 2·58c. per lb., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., May 26, 1913.

Cacao—Venezuelan, $14·40 per fanega; Trinidad, $14·15 to $14·50 per fanega
Coco-nut Oil—$1·13 per Imperial gallon.
Coffee—Venezuelan, 16c. per lb.
Copra—$4·75 per 100 lb.
Dhal—$4·50.
Onions—$2·10 to $2·30 per 100 lb.
Peas, Split—$6·15 to $6·20 per bag.
Potatoes—English, $1·75 to $2·00 per 100 lb.
Rice—Yellow, $5·40 to $5·50; White, $5·75 to $6·00 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., May 17, 1913; Messrs. T. S. Garraway & Co., May 16, 1913; Messrs. Leacock & Co., May 10, 1913.

Arrowroot—$4·75 to $7·50 per 100 lb.
Cacao—$1[illegible]·00 to $14·00 per 100 lb.
Coco-nuts—$18·00
Hay—$1·50 per 100 lb.
Manures—Nitrate of soda, none; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $85·00 per ton.
Molasses—No quotations.
Onions—$1·03 to $2·25 per 100 lb.
Peas, Split—$6·00 to $6·25 per bag of 210 lb.; Canada, $4·40 per bag of 120 lb.
Potatoes—Nova Scotia, $2·00 to $3·65 per 160 lb.
Rice—Ballam, $5·05 to $6·10 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $4·00 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, May 24, 1913; Messrs. Sandbach, Parker & Co., May 9, 1913.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	8c. per lb.	——
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	——
Cacao—Native	18c. to 19c. per lb.	19c. per lb.
Cassava—	72c.	——
Cassava Starch—	$5·00 to $6·00	——
Coco-nuts—	$16 to $20 per M.	$10 to $16 per M.
Coffee—Creole	17c. to 18c. per lb.	18c. per lb.
Jamaica and Rio	18c. per lb.	19c. per lb.
Liberian	13½c. per lb.	12c. per lb.
Dhal—	$3·75 to $4·00 per bag of 168 lb.	$3·75 to $4·00 bag of 168 lb.
Green Dhal	$5·00	——
Eddoes—	60c. to 84c.	——
Molasses—Yellow	None	——
Onions—Teneriffe	6c. to 7c.	——
Madeira	6c. to 7c. per lb.	——
Peas—Split	$6·50 per bag (210 lb.)	$7·50 per bag (210 lb.)
Marseilles	——	——
Plantains—	16c. to 40c.	——
Potatoes—Nova Scotia	$2·25	$2·40
Lisbon	——	——
Potatoes-Sweet, B'bados	96c. per bag	——
Rice—Ballam	No quotation	——
Creole	$4·75 to $5·00	$5·00
Tannias—	$1·20	——
Yams—White	$1·68	——
Buck	$1·44	——
Sugar—Dark crystals	$2·25 to $2·30	$2·30
Yellow	$3·00	$3·25
White	$3·75 to $4·00	$5·00
Molasses	$2·00	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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PAMPHLET SERIES.

The Pamphlets are written in a simple and popular manner and the information contained in them is especially adapted to West Indian conditions. They contain, amongst other subjects, summaries of the results of the experiment work on sugar-cane and manures, the full official reports of which have only a limited circulation. The number issued up to the present time is seventy. Those mentioned in the following list are still available: the rest are out of print.

SUGAR INDUSTRY.

Seedling and other Canes at Barbados
in 1900. No, 3, price 2*d.*; in 1901, No. 13, price 4*d.*; in 1902, No. 19, price 4*d.*; in 1903, No. 26, price 4*d.*; in 1904, No. 32, price 4*d.*
Seedling Canes and Manurial Experiments at Barbados, in 1903-5, No. 40, price 6*d* ; in 1904-6, No. 44, price 6*d.*; in 1905-7, No. 49, price 6*d.*; in 1906-8, No. 59, price 6*d.*; in 1907-9, No. 62, price 6*d.*; No. 66, price 6*d.*
Seedling and other Canes in the Leeward Islands, in 1900-1, No. 12, price 2*d.*; in 1901-2, No. 20, price 2*d.*; in 1902-3, No. 27, price 2*d.*; in 1903-4, No. 33, price 4*d.*; in 1904-5, No. 39, price 4*d.*; in 1905-6, No. 46, price 4*d.*; in 1906-7, No. 50, price 4*d.*; in 1907-8, No. 56, price 4*d.*; in 1908-9, No. 63, price 6*d.*; in 1909-10, No. 67, price 6*d.*
Manurial Experiments with Sugar-cane in the Leeward Islands, in 1902-3, No. 30. price 4*d.*; in 1903-4, No. 36, price 4*d.*; in 1904-5, No. 42, price 4*d.*; in 1905-6, No. 47, price 4*d.*; in 1906-7, No. 51, price 4*d.*; in 1907-8, No. 57, price 4*d.*; in 1908-9, No. 64, price 4*d.*; in 1909-10, No. 68, price 4*d.*

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The 'Agricultural News' contains extracts from official correspondence and from progress and other reports; and, in fact, any information indicating what is going on in each colony, and the progress made in Agricultural matters throughout the West Indies.

The 'Agricultural News' is printed in time to be distributed, regularly, by each mail, and is on sale by the local agents of the Department at one penny per number, post free, 2*d.* The subscription price, including postage, is 2*s.* 2*d.* per half-year, or 4*s.* 4*d.* per annum. Volumes IV, V, VI, VII, VIII, IX, X and XI complete, with title page and index, as issued—Price 4*s.* each.—Post free, 5*s.* Some numbers of the early volumes are out of print and therefore these volumes can no longer be supplied complete. The scale of charges for ADVERTISEMENTS may be obtained on application to the Agents. All *applications for copies are to be addressed to the Agents, not to the Department.*

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London: Messrs. DULAU & Co., 37, Soho Square, W.
Barbados: ADVOCATE CO. LTD., Broad Street, Bridgetown.
Jamaica: THE EDUCATIONAL SUPPLY COMPANY, 16, King Street, Kingston.
British Guiana: THE 'DAILY CHRONICLE' OFFICE, Georgetown.
Trinidad: Messrs. MUIR-MARSHALL & Co., Port-of-Spain.
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(Vol. XIII, No. 2.)

Containing Papers on SUGAR-CANE EXPERIMENTS IN BRITISH GUIANA, prepared for the recent Agricultural Conference, comprising: Sugar-cane Experiments in British Guiana, By Professor J. B. Harrison, and others; Part I.—Introduction; Part II.—The Composition of the Soil-water as affected by Cultivation and Manuring of the Soil; Part III.—The Manuring of the Sugar-cane; Part IV.—The Effects of Cultivation and of Manures on the Soil of the Manurial Experiment Fields; Part V.—Varieties of Sugar-cane.

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A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

VOL. XII. No. 291. BARBADOS, JUNE 21, 1913. PRICE 1*d*.

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Elasticity of Demand.

A SOMEWHAT notable circumstance attendant on the production of sugar is that fluctuations in the market values, although they may seriously affect the grower, are to a large extent imperceptible on the side of the consumer. The recent plethora of production occasioned principally by a successful season in Cuba, has, together with a certain degree of speculation, been the chief cause of a continued decline in prices, and the present situation, howbeit distressing for the smaller manufacturer far separated from the leading markets, affords a suitable occasion for considering, in a general way, some of the economic circumstances surrounding the consumption of sugar and other kinds of raw material, in relation to fluctuation in prices.

It is important to realize at the outset that sugar, as such, generally goes to the consumer in remarkably small quantities compared with those in which it is produced, and that it is an extremely cheap commodity. The result is, that, although a fall below the normal of a fraction of a cent per pound may seriously affect the grower, this drop cannot, under ordinary circumstances, be directly felt by the consumer, unless he buys in sufficiently large quantities—in far larger quantities than can be purchased in retail transactions, by individuals belonging to the middle and lower classes.

By considering an opposite procedure that might conceivably be taken by the retail seller in times of overproduction—the course of offering larger quantities at the usual current price—we are brought to face the economic law which constitutes the main theme of this article. It is highly probable that the adoption of such a course in the case of sugar, would not lead to increased demand, but would rather tend to diminish it, for the demand for sugar at the present time, particularly in Great Britain, is not elastic. To explain exactly what is meant by this term, it may be well to begin by observing that one universal characteristic of human nature is the circumstance that a person's desire for any commodity, diminishes, other things being equal, with every increase in his supply of it. The rate of diminution may be rapid or it may be slow; the consumer may be easily satisfied or satisfied only after greatly increased consumption. If, under existing conditions, he is easily satiated, then a small decline in the retail price of the commodity will cause only a slight increase in his purchases, and the converse will be the case if he is satisfied only slowly. Under the former circumstances, the elasticity of demand is small; in the latter case it is considerable. It follows naturally, that when the demand is elastic for a fall in price, it is also elastic for the opposite rise.

The demand, to-day, in Great Britain for a commodity like sugar is not elastic, although it used to be when prices were sufficiently high to allow of fluctuation. Consequently, as already hinted, no fractional diminution in the price would greatly increase the demand, and an increase in the amount at the same price would not increase the number of purchases. The same principle holds good in England, with a commodity like salt, of which the price is relatively so low as to cause few people to consider its value, and the majority would use almost as much if the price rose a little as they do under present circumstances. In India, however, the price of salt is relatively high, and in consequence the demand there is moderately elastic.

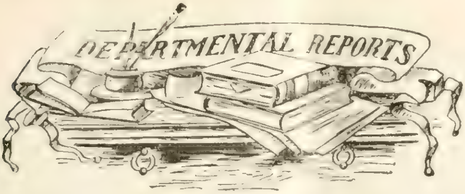
The question as to whether the price of a commodity ought to be kept at a low and fixed rate, especially when its supply as agricultural produce must vary, is not a matter to be discussed in the present connexion, but it is interesting to note that in regard to very perishable produce like fruit and meat, the current supply price must be adjusted in such a way as to create an elastic demand in order to check waste during times of over-production.

This consideration leads naturally to the subject of other uses of certain kinds of raw material besides that for direct consumption. In regard to sugar, there is the enormous demand for this commodity for preserving and for confectionery purposes, and in this direction there exists very considerable elasticity of demand. In times of over-production of sugar, it is through sources like these that the pressure would seem most easily to be relieved. The demand for sweetmeats, for instance, is proverbially elastic, and the effect of increasing the quantity at the usual price would be to attract a far larger number of purchasers. It must be remembered in this connexion that the sale of one commodity in a manufactured form is frequently limited by others, as for instance, sugar and cacao in the manufacture of chocolate, and fruit and sugar in the production of jam; consequently a high range of prices for one commodity, though accompanied by low values for a second one may so counterbalance each other as to render the position a normal one to the manufacturer though extremely abnormal to the growers.

In dealing with all questions concerning the demand of the consumer, it is generally easier to obtain a clearer notion of the circumstances of any case if one class of society be considered at a time. In regard to the consumption of sugar, as such, the lower classes may consume per head as much as the rich; but with commodities like meat, tobacco, tea and spirits, the elasticity of demand increases rapidly as one descends from rich to poor. And an interesting factor which will be seen to enter into the subject here is that of grade and brand. The reflections already expressed in regard to the demand for sugar will be understood to have had reference to the regular consumers of one grade, though some elasticity of demand will be found to exist in connexion with the various preparations of this article, as in the consumption of syrup or fancy molasses, muscovado and crystals.

Even amongst the rich an elastic demand can be created by grade and brand. But this often depends upon the existing degree of sensibility; some people there are who care little for a refined flavour or a distinctive appearance, provided they can get plenty of the particular commodity. The chief cause of elasticity of demand amongst the rich is perhaps the desire to obtain luxuries for purposes of display and social distinction—a desire which is practically insatiable. This feature of modern civilization is an important factor in industries which depend on the production of grapes, tobacco, rubber and similar commodities, and is actually potent in the respective systems of cultivation, as for example, in the production of light-coloured rubber irrespective of its strength.

The sugar-grower, will be seen, then, to labour under certain disadvantages of demand that are absent in the affairs of many other producers of raw material, and the solution of his problems in this direction and even their exact comprehension are difficult in view of the fact that his economic position is so extremely complicated. Closer, and a more organized contact with the market and consumer has followed the introduction of modern central sugar factories, and in this direction would appear to lie the remedy for many of the economic difficulties in the regulation of supply and demand encountered by independent growers at the present time.



SUGAR-CANE EXPERIMENTS IN THE LEEWARD ISLANDS, 1911-12.

The form of publication introduced during the previous year has been adhered to in issuing the present report. The omission of a large number of tables made it possible to publish Part I and Part II together, in the form of a handbook that should be of convenient size both for distribution and for reference.

Part I of the report describes the results of the continuation, during the season 1911-12, of the trials with a large number of Barbados, Demerara and Leeward Islands seedling canes. Comparison with previous years' reports will show that three Barbados and two Antigua seedlings have this year been introduced into the general series of experiments; these have replaced the number of Demerara seedlings which repeated tests have shown to be unsuited to conditions obtaining in the Leeward Islands. As regards the Antigua experiments with plant canes, the list is headed by B. 3922 with a yield of 6,020 ℔. of sucrose per acre. This is the first year that the variety has been introduced into the general series of experiments. The experience of the present year will therefore require to be firmly substantiated by subsequent trials. The variety second on the list was B.4596, which gave an average return per acre of 5,590 ℔. of sucrose. It yielded an average of 28·1 tons of cane per acre, and in this respect was superior to all other varieties. The present is the fifth occasion on which this cane has been cultivated in these experiments, and it has always occupied a leading position in the returns. It may therefore be confidently recommended. Sealy Seedling, which has also in past years shown itself suited to the conditions obtaining in Antigua, came third, with a return of 5,260 ℔. of sucrose per acre. It is of interest to note further, that the sixth cane was B. 6450. This variety has given very satisfactory results in Barbados. In regard to ratoons in Antigua, the first two canes on the list were B. 4596 and B. 1528; D. 625 dropped considerably in position as a ratoon.

Turning from the results on seedling varieties in Antigua to the results obtained in St. Kitts, it may be observed first that the list for this island was headed by D. 109 (plant canes). This variety has for years passed given satisfactory results. In the present series of results it yielded an average return of 6,640 ℔. of sucrose per acre and 32·3 tons of cane per acre: it gave juice of average saccharine richness of 1·84 ℔. per gallon. White Transparent came second with a yield of 6,030 ℔. of sucrose, and D.116 third with 5,810 ℔. of sucrose. The fourth variety was B.208. Its juice had an average saccharine richness of 2·15 ℔ of sucrose per gallon. The eighth variety was the one that was second in Antigua, namely, B.4596. On the whole, this cane does not appear to be as well suited to St. Kitts conditions as to those obtaining in Antigua. In regard to the ratoon canes in the St. Kitts experiments, it is pointed out in the report that in reviewing the results obtained, it should be borne in mind that the ratoon canes had been reaped only from those stations where moderately favourable weather conditions had been encountered. B.1753 headed the list, followed by B.208, D.625 and B.4596.

Following the practice commenced in the previous year, a plot of seedling varieties was reaped experimentally during the year under review, in Nevis. Very unfavourable weather was experienced in this island during the growing season. B.4596 headed the list, whilst B.376 and B.147 were second and third. It is stated that no great amount of weight should be attached to these results at present.

One of the most interesting sections of the report under review is that which shows the returns as regards the acreage under the different varieties. In Antigua, the area under B.147 increased by 189½ acres, whilst that under Sealy Seedling underwent an extension of 616½ acres. White Transparent decreased by 1,189 acres. This latter circumstance is significant, in view of the fact that White Transparent is susceptible to root disease, which is very prevalent in some parts of Antigua. Change as regards the acreage under different varieties in St. Kitts is chiefly seen in a decrease for B.208 and B.147 of 285 and 397 acres, respectively.

Part II of the report concerns manurial experiments. These have been pursued in past years concurrently with the testing of varieties. By referring to the discussion and interpretation of the results of the main series of experiments which were conducted on first ratoon canes, it will be observed first, that in the phosphate series the results of the present season again bear out previous experience, and show that application of phosphatic manures has, on the average, resulted in decreased yield. The same result also holds true in the potash series, the application of this class of manure having in all cases resulted in a smaller yield. Reference to the diagrams on pages 75 and 79 will show substantial pecuniary profits in the case of the experiments Nos. 13, 15, 16, 17, 19 and 20. The important fact to bear in mind is that each of these received varying amounts of nitrogen either as nitrate of soda or sulphate of ammonia without potash or phosphate. Nitrate of soda has given better results than sulphate of ammonia. The effect of dividing the dose of nitrogen has been to give a lower yield. The experiments with nitrogen and nitrate of lime, which are described next, have led to the conclusion that both manures produce small increases of yield, nitrate of lime giving better results than nitrolim. On the whole, however, it is considered that nitrolim is not well adapted to the requirements of ratoon canes under conditions obtaining in Antigua and St. Kitts.

The remaining pages of the publication deal in an interesting manner with general considerations relative to the manuring of sugar-canes in the Leeward Islands. It is pointed out that in most cases rainfall must be the chief factor which limits the economic application of manures. Reference is made to the existence of an equilibrium of food-supply in the soil, the maintenance of which should be the ultimate aim of the planter. The discussion of these matters may well be given careful consideration by those who are interested directly or indirectly in the management of sugar estates.

The report concludes with an account of experiments on the value of the cultivation of ratoon canes, and on molasses as a fertilizer for cane lands. The former investigation led to the conclusion that the cultivation does more good than otherwise; whilst in connexion with the molasses experiment, although an appreciable increase of yield was obtained during the year under review, it is rightly held that no reliable inferences can be drawn from one experiment.

FRUITS AND FRUIT TREES.

FACTS CONCERNING INDIAN MANGOES.

The climatic conditions which have proved to be best suited to mango culture in India have recently been dealt with in an article in the *Cuba Magazine* for April 1913. It is pointed out first, that to the mind of the average northern horticulturist the mango is best adapted to a hot, humid, and typically tropical region like that of lower Bengal, whereas the fact is that in India the mango thrives best in a region like that in the neighbourhood of Saharanpur at the foot of the Himalayas, where the average annual precipitation is only about 35 inches. Here during the season when the mangoes are reaching maturity no rain falls, and the air is extremely hot and dry. It is stated that this comparatively dry atmosphere, coupled with extreme heat, has led to the production of mangoes which have made Saharanpur famous. In this district, a temperature of 100° F. and above may continue throughout the twenty-four hours of the day during the ripening season. Occasionally, during winter, as much as 12° of frost has been recorded; and herein lies an explanation, that cold snaps, even with low temperatures, do little harm—indeed may be very beneficial if they are of very short duration.

In some places in India where mangoes are cultivated, the precipitation may be as much as 100 inches, but this does not fall during the flowering season. In this connexion the circumstance which was pointed out in a recent article in the *Agricultural News* may again be noted—that the mango flower possessing only one pollen-bearing stamen and a stigma that is exposed to the weather, always suffers damage if rain is received during the period of pollination.

Turning from the discussion of climatic conditions in relation to mango culture in India, the article under consideration proceeds with the subject of soils and the cultivation of the tree. It is well known that the mango is not particular in regard to soil, requiring only that it be well drained and reasonably deep. In India grafted trees are usually planted 35 feet apart, though some successful growers have obtained good results by planting at a distance of 20 feet. Holes are dug 4 feet in diameter and 4 feet deep, and the subsoil replaced by some of the surface soil. If available, a quantity of stable manure is placed in the bottom of each hole. A very interesting feature remarked upon in connexion with the manuring of the mango is the practice employed by growers, in former years, near Bombay. Ten pounds of common salt was applied to each tree in September. This arrested growth in October and November, and encouraged the formation of flower buds. In a dry climate this would be unnecessary, but it might produce good results in an extremely warm and moist region where the trees are naturally encouraged to continue growing all the year round.

Amongst the facts presented on the picking and distribution of the fruit mention may be made of the processes of curing. Each fruit is packed loosely in straw or soft grass, and laid on a bench in the curing or sweating room, which must be well ventilated and as cool as possible. In a day or two they are perfectly ripened and ready for the table. It is emphasized that great care and attention should be bestowed upon curing and picking, since this is amptly recompensed by the improvement in the flavour of the juice. For shipping, the fruits are picked a few days before they are ready to drop from the tree, and are packed in baskets of straw, each specimen being wrapped in soft paper.

The article concludes with a description of some twenty varieties of Indian mangoes. Reference may be made to the Alphonse of Bombay, already frequently noted in the *Agricultural News* as one of the finest varieties; to the Bombay Yellow, of the United Provinces, which ranks so high as a shipping variety; to the Fuslibewa, one of the largest varieties in cultivation, weighing up to 4 lb.; and lastly to the Kohitoor, which is regarded as by far the best in quality of all the Murshedabad varieties. A story is told of this latter variety. Haking Aga Muhammed, who owned a parent tree, sent some of the fruits to Rajah Hosseim Ali Mirza Bahadur, who was a great mango enthusiast. Upon tasting the fruits, the Rajah offered 2,000 Rs. for the tree, which has ever since remained in his possession.

In reproducing an article that appeared recently in the *Agricultural News* on the South American plant, *Hedychium coronarium*, as a new source of paper, the *Queensland Agricultural Journal* (April 1913) remarks upon a statement made in this article, namely that the fibre derived from the new source has been found to be equal in strength to the best pure Manila hemp, which is the only fibre that can be used in the self-binding reaping machine. The above-quoted journal states that in Queensland, sisal hemp has proved successful as a twine for reapers and self-binders.

PROBLEMS IN PROPAGATION BY CUTTINGS.

In continuation of this abstract of Professor Bayley Balfour's recent lecture (published in the *Journal of the Royal Horticultural Society* for March 1913) reference may be made to some interesting allusions to problems of vegetative propagation offered by monocotyledonous plants. Most people are disposed to think that monocotyls do not propagate by cuttings. To dispel this idea the lecturer proceeded to describe the development of an Asparagus cutting: the ideas involved, however, can be more aptly illustrated to suit tropical conditions by referring to the propagation of the sugar cane. The germination of the cuttings of this plant were very fully described in a recent issue of the *Agricultural News* (Vol. XII, pp. 158 and 159) and the principle of development may be summed up by saying that growth consists first in the enlargement of a lateral bud and the formation underneath it of a new stem from which arise adventitious roots. It should be pointed out, however, that in the sugar-cane cutting, root development occurs first at the nodal zone to supply the preliminary moisture required to set bud development in action. The essential feature is that a new plant is produced from each bud, which is quickly separated from the cutting by a layer of cork. Its connexion with the original stock is severed. From the beginning, the monocotyledon displays lateral growth; from the beginning, the dicotyledon has the instinct of terminal growth, which is always more rapid than lateral development. The terminal shoot of the dicotyledon extends as the new plant from the rooted cutting. A lateral bud develops as the new rooted plant in the monocotyledon and the terminal portion of the cutting dies.

The next important point dealt with in the lecture was propagation by root cuttings. In the term 'root cutting', the true root is referred to. It is pointed out that this is governed by the same conditions that regulate propagation by stem cuttings. One thing, however, is different. The tendency for roots to produce adventitious buds is not as strong as the tendency of stems to produce adventitious roots. The cut surface of the dicotyledonous root cutting generally forms callus as in the stem cutting, and in this callus the shoot buds will be produced. If not, the buds may develop from the pericycle from which the daughter roots also arise. It is noted that comparative experimental work with root cuttings has not been extensive and that there is much to learn in regard to the stimuli conducing to shoot formation from roots.

Turning from the subject of roots, attention was given next to propagation by leaves. After referring to Bryophyllum, and to the function of the swollen leaf in a lily bulb, the lecturer goes on to say: 'given the possession of adequacy of active indifferent cells, that is to say, cells not already impressed with a definite morphological destiny, and of a sufficiency of food, then in proper conditions of moisture, aeration, and temperature, any leaf may be used as a cutting. Nor is the whole leaf necessary—petiole alone, or lamina alone, or portions even of these may serve. . . . . The practice of using leaf-cuttings was more commonly employed in the past that it is now; propagation of citron, lemon, and laurel by this method is of great antiquity. Nowadays, however, it is restricted by gardeners to a comparatively small number of facile forms—such, for example, as one finds in Begonia, Melastomaceae, Gesneraceae, Crassulaceae, where there is substance and abundant water in the leaf—soft leaved plants one may call them.'

In continuation, it would appear that the chief difficulty which accompanies leaf-propagation is the slowness with which, not the roots, but the bud shoots form. This is seen, for example, in *Ficus elastica*, Camellia, and *Hoya carnosa*. The paring of callus does not overcome the difficulty as it does in the case of root formation from dicotyledonous stem-cuttings, and it would appear that the subject is deserving of continued investigation. There is evidence to show that the quality of the food material in the leaf affects shoot development.

Turning from these matters to the final subject in the lecture, namely the environmental conditions necessary for the quick 'striking' of cuttings, it was pointed out that the chief external stimuli are air, heat and water. Air is often overlooked and the old canon should always be borne in mind, 'that the sunk end of the cutting should go no deeper than is sufficient to maintain it steady in the soil.'

Proceeding with the subject, attention is given to the artificial methods adopted to ensure quick vegetative development experimentally at the Royal Botanic Gardens, Edinburgh

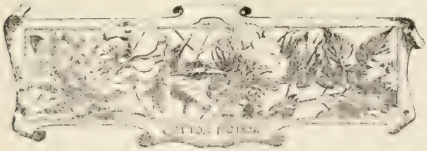
The two outstanding lines of practice there may be termed: (1) under-root watering in shade; (2) overhead watering in sunshine The chief feature of (1) is that the soil for cuttings overlies a chamber containing water from which the soil is separated by a layer of air. The water can be heated to a required degree by the water of the heating system circulating in the 1½ inch pipe at the bottom of the tank, and the moisture rising from the surface of the heated water ascends through a sparred frame and passes upwards through the overlying soil. In this way the soil is kept moist, and any required temperature can be maintained by regulation of the valve. It is believed that the temperature condition is of paramount importance.

The above method is particularly adapted to plants with hairy and woolly surfaces. It eliminates the risk of surface decay that attends overhead watering in such plants.

The second practice, that of overhead watering in the sun, is believed to have been borrowed originally from the French. The method adopted at Edinburgh is as follows. The cuttings are plunged in sand in an ordinary frame exposed to full sunshine and watered at short intervals, say every half-hour. The watering may be done automatically or by hand, but the latter involves frequent opening of the frame. The soil temperature may rise to an intense degree, but fluctuates. Some plants under this treatment 'strike' much more rapidly than under the first system.

In conclusion, the lecturer drew attention to the possible importance of direct sunlight as a factor (irrespective of heat unit) in the germination of cuttings, and finally emphasized the paramount importance of soil temperature in any considerations concerning the interesting and economically invaluable practices involved in the subject of his lecture.

The results obtained at the Agricultural Experiment Station, St. Croix, with seedling canes raised in that island, are described in the St. Croix *Avis* for April 23, 1913. The first table of figures shows the results obtained during 1911. The list is headed by S.C. 12-1 which yielded 5,588lb. of sucrose per acre. The results of the second year seedlings are interesting in view of the fact that S.C. 12-11, which was eleventh in the first year, retained its high position and gave cane at the rate of 26·8 tons per acre during ten months of growth in a dry year. The juice of this cane was found to be very rich and pure. In the second year it was found that S.C. 12-60, which was last out of sixty in 1911, rose from this place to thirteenth in 1913.



WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date June 2, with reference to the sales of West Indian Sea Island cotton:—

About 300 bales of West Indian Sea Islands have been sold since our last report, chiefly St. Martin from 17*d.* to 18*d.*, Barbuda 17*d.* and Nevis 16½*d.* to 18*d.*, with a few St. Croix at 18*d.* and Barbados at 19*d.*

The stock has been largely increased with recent arrivals. Buyers are only disposed to purchase from hand to mouth, and prices in consequence are rather easier

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending May 24, is as follows:—

The sales this week consisted of several planters' crops at 26c. to 32c., amounting to 170 bales. There continues to be no demand for the remaining stock of odd bags of off cotton at the asking prices of Factors, so that with the exception of the above sales of crop lots the market remains unchanged, and therefore we have only to renew our last quotations, viz :

Extra Fine	28c. to 29c.	= 16*d.* to 16½*d.*	c.i.f., & 5 per cent.
Fully Fine	26c. to 27c.	= 14¾*d.* to 15¼*d.*	,, ,, ,, ,,
Fine	25c.	= 14¼*d.*	,, ,, ,, ,,
Extra Fine off in preparation	22c.	= 12½*d.*	,, ,, ,, ,,
Fully Fine off in preparation	18c. to 20c.	= 10½*d.* to 11½*d.*	,, ,, ,, ,,
Fine off in preparation	18c.	= 10½*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to May 24, 1913, were 1,336 bales, 4,451 bales, and 4,608 bales, respectively.

Agricultural Credit.—Prussian views have recently been abstracted in the *Experiment Station Record* for March 1913, where the legal limitations of mortgage indebtedness in relation to the taxable value of lands are dealt with, together with the possibility of securing credit for agricultural purposes at lower rates of interest. It is frequently held to be advantageous, to have the mortgage indebtedness on land constantly increasing. In the article referred to, however, this view is opposed, and it is maintained that economic advancement in agricultural land must be accompanied by an increase in the investment of circulating (working) and fixed capital. This additional demand is likely to lead to an increase of agricultural credit. Increases in land values are held to reduce, and not to increase, the circulating capital; for an agricultural population, as a rule, does not grow richer in the same proportion that the value of the land increases, and every time the land changes hands a larger amount of fixed capital must be invested in order to work it properly. This amount is usually taken from the circulating capital, and the larger credit which this increased land value permits does not affect operating capital but only places a higher charge upon agriculture.

RECENT VIEWS ON THE UNIVERSITY QUESTION.

The Report of the Committee appointed by the Board of Agriculture, Ceylon, to arouse public interest in the question of a College of Tropical Agriculture situated in that island, has just been received, and the following is a summary of the case which it puts forward:—

(1) A college and not a university is advocated, though it is contemplated that a college might develop naturally into a university in the course of time.

(2) Proximity to the great centres of education and research in Europe and America is not considered essential.

(3) On the other hand, the proximity of Ceylon to the great planting areas in the Eastern Tropics, in tropical Australia and in British East Africa is considered an essential feature of the case.

(4) Great importance is attached to the existence, in Ceylon, of large areas under diverse cultivations, to the existence of a dry and wet zone, and to the superiority of the Ceylon Royal Botanic Gardens, which have for years been the training ground of a considerable number of agricultural students.

The Ceylon Report has recently been criticized in the *India Rubber Journal* (May 3, 1913). Reference is also made in this journal to the Trinidad proposals. The points adduced may be stated thus:—

(1) That the Ceylon authorities are not clear as to what is wanted

(2) It is stated that 'the Trinidad scheme is nonsense.'

(3) This journal is of opinion, however, that 'there is something to be said in favour of a college or experimental station on which young men, both in the Tropics and going from home, might see something of the theory and practice of tropical agriculture as applied to various products.'

(4) Emphasis is laid upon the importance of maintaining a well-trained and active minded staff of lecturers. In this connexion, close contact with British Universities is strongly advocated.

In continuation of the subject, a letter, apparently written by Professor Farmer, of Cambridge, has lately appeared in *Nature* (May 8, 1913). The views expressed in this communication are as follows:—

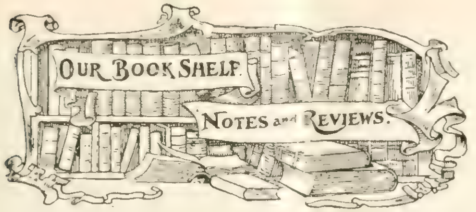
(1) It is doubted whether the advocates of the Tropical University clearly differentiate between a University and a College of University rank.

(2) The latter, if generously maintained and kept in intimate contact with British Universities would be, it is believed, a valuable asset to the Empire. The former, however, could not be immediately created, but would have to grow and justify its own existence.

(3) Sympathy is expressed as regards the West Indies as a site for the University College advocated, in view of the geographical situation of the islands and their diversity of agricultural, climatic and labour conditions.

The general inference to be drawn from the foregoing opinions would seem to be that it would be advantageous locally, as well as in a wider or Imperial sense, to have an Agricultural College in the West Indies, and also in Ceylon, provided that the latter could arrange to co-operate with well-established Universities.

The exact meaning of the reference to 'seeing something of the theory and practice of tropical agriculture' in (3) of the second article cited, and the meaning of the term 'college *or* experimental station' in the same section, is difficult to understand, in connexion with serious considerations on education.


OUR BOOK SHELF.
NOTES and REVIEWS.

MOZAMBIQUE: ITS AGRICULTURAL DEVELOPMENT. By R. N. Lyne, F.L.S., F.R.G.S. *T. Fisher Unwin.* London. 12*s.* 6*d.*

The author states in the preface to this volume, that it does not claim to be a handbook with any pretence to authority on the agriculture of Mozambique, but rather an epitome of the conclusions arrived at after eighteen months' examination of the territory and its agricultural resources, with the object of revealing Portuguese East Africa to the investor. In view, however, of the author's former positions as Director of Agriculture in Mozambique and in Zanzibar, and his present appointment as Director of Agriculture, Ceylon, the book must be regarded as a particularly valuable and authoritative source of information.

Starting with a description of the country's splendid system of rivers and other natural agricultural advantages, the author proceeds to point out that the Province is well placed as regards markets, being to a certain extent independent of Europe. Then follows a description of the geography of the country of Portuguese East Africa.

Chapter VII relates to the sugar-planting industry. There are seven factories operating in the Province of Mozambique with an approximate out-put for 1911 of 27,600 tons of sugar. The adaptability of the Yuba cane to conditions such as exist in Mozambique is referred to. On the subject of the coco-nut industry, not only does the author give detailed statistics but also discusses the *modus operandi* of planting the trees, and the practice of cutting away the lower branches after the plants have been established in the plantation

The problem of the future of rubber-planting is of considerable importance, and practical experience is advocated before coming to a decision as regards the investment of capital. Following this is an account of the cultivation of Ceara rubber and the tapping of the tree. Carbolic acid, it is stated, is now being used as a coagulating agent in German East Africa in the place of a 3-per cent. solution of acetic acid. Continuing the subject of rubber in the following chapter, we are informed that the chief source in Mozambique is the root of a type of Landolphia, probably *L. Kirkii.* There is an interesting description of the method employed by the natives in collecting rubber from this species; much is said, also, with regard to the management of the forests.

The growing of sisal hemp is the next topic which receives attention and some instructive details are given concerning cultivation. A subsequent chapter is devoted to what is probably the most profitable industry in East Africa, that of tobacco-growing. After describing the prospects of cotton cultivation, some useful information is given with regard to the production of oil from the seed of the *Trichilia Emetica*, which grows profusely in Inhambane. The uses of the cashew tree and nut which, like the above, is a native of South America, are also explained. The minor products of the country--ground-nuts, rice, wattle, Phormium, Tenax and maize constitute the subject-matter of Chapter XIV.

With reference to cattle breeding and dairying in the Lorenzo Marques district, it is stated that conditions there are somewhat similar to those in all tropical areas, 'where' proceeds the author, 'cattle breeding will never be more than a subsidiary industry.' This statement, however, would appear to be somewhat sweeping and open to debate. An interesting circumstance is alluded to in the same chapter, namely, that the farther north one travels the fewer is the number of oxen that is seen to be yoked into a team. This is supposed to be a result of the enervating influence of the tropical sun.

There is much to interest the reader in a chapter on fruit-growing. Bananas are not yet cultivated in Mozambique, but it is thought that something might be effected by extended trials of this plant. Good results might also accrue from the planting of spices such as vanilla, nutmegs and cinnamon. The author's remarks on these industries are well worth reading and should interest planters in the West Indies.

Little is said with regard to the natural forests, in Mozambique, but conditions in the Province, in this respect, appear to resemble somewhat those existing in British Guiana.

A sparse population is undoubtedly the chief drawback to the agricultural development of the country, and this problem is dealt with at some length in Chapter XXIV. 'Tropical Africa abhors bustle' writes the author: This temperament, pervading a meagre density of 20 to 30 to the square mile renders it moderately evident that labour-supply must be a limiting factor.

The last chapter in the book is reserved for the discussion of the Fiscal System.

There are two appendices; a few notes on Ceara rubber in East Africa comprising the first, the second being entirely devoted to the Land Law.

The printing of this book leaves nothing to be desired, and the author has obtained several good and well selected photographs. A useful index is provided together with a good map of the Province, of which the northernmost point is seen to be the Rufuma River, and the most southern, Oro Point, some 50 miles south of the port of Lorenzo Marques.

The World's Production of Beet Sugar.—Practically one-half of the world's supply of sugar is furnished by the sugar-beet. An equal quantity is extracted from sugar-cane. The sugar made from the sugar maple, sorghum, palm and other plants, is not enough to be considered in the world's markets. The sugar from cane is, of course, produced in tropical and sub-tropical countries. The greater part of the beet sugar comes from Central Europe. Germany leads with over 2,800,000 tons annually. Next in order comes Russia with 2,250,000 tons, Austria-Hungary with 1,678,000 tons, France with 783,000, Belgium with 312,000, and Holland with 239,000 tons. All these countries produce sugar for export. The United States produces 600,000 tons of sugar from beets. It will be seen that the culture of the sugar-beet plays a very prominent *rôle* in the agriculture of Northern Europe, and that it occupies a correspondingly prominent place in the national economy. (Form the *Journal of the Royal Society of Arts*, April 25, 1913.)

Information received recently from the Agricultural Superintendent, St. Vincent, shows that weather in that island was, during May, too dry to enable much progress to be made in the preparation of lands for planting cotton and other crops. Large numbers of coco-nuts have recently been imported for planting purposes.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The subject treated of in the editorial in this number is Elasticity of Demand. The considerations concern mainly the relation of this economic force to fluctuations in the values of raw material.

On page 195, the recently published report on sugar-cane experiments in the Leeward Islands, 1911-12, is reviewed, in such a manner as to indicate the more valuable results that have been obtained.

The concluding article on problems in propagation by cuttings is continued from the last issue of the *Agricultural News*, on page 197.

On page 198 will be found presented, in a concise manner, recent views on the Tropical University question.

Under the caption Book Shelf, on page 199, will be found a review of an important work describing agricultural conditions in Mozambique.

Insect Notes, on page 202, comprise information on the subject of insects liable to dissemination in shipments of sugar-cane.

On Page 206 will be found Fungus Notes which describe recent work on the Panama disease of bananas in Jamaica. Reference is also made to several new exotic fungi.

Superiority of Tin Cans over Pots for Seedling Plants.

An ingenious investigation into the circumstance, observed in Hawaii, that seedling plants like mango and avocado, grow better in tin cans than in earthernware pots, is described by E. V Wilcox in Press Bulletin No. 41 of the Honolulu Experiment Station.

For the practical propagator the results of the investigation are of very considerable importance, and of a character highly suggestive.

As a working basis it was supposed that the two factors involved were differences in evaporation, and stimulation due to tin and solder in the cans. In the course of the experiments it was found that the average evaporation from pots was exactly two and a half times greater than that from the tin cans, though as might be expected, in sunshine, the relative increase was greater for the tins owing to the more rapid penetration of heat. The soil in a pot was found to be more exposed to evaporation than even the greater surface area would indicate. A more interesting result was the discovery that with the ordinary pot, 52·3 per cent. of the evaporation takes place through the top, and 47·7 per cent. through the side. Further determinations showed that the evaporation from a given area is 3·5 times as fast through a free surface of soil, as through the side of the pot.

A continuation of the investigation consisted in the growing of seedling plants in pots of varying porosity, and the height and vigour of the plants increased in regular gradations as the porosity diminished. It was next found desirable to determine the loss of water by transpiration.

This was done by the remarkably simple method of substracting the loss in the tins and pots without plants from the loss from the tins and pots with plants.

The results showed that the total loss from two months old plants in pots was approximately the same as that from two months old plants in tins, the explanation being, of course, that the greater loss by transpiration from the larger and more vigorous plants in the tins, balanced the greater loss by evaporation from the soil in the pots. Leaf measurement showed that transpiration was 1·6 times greater in the case of the plants in tins, and therefore they might obviously be considered as growing more vigorously.

The great advantage of using tin cans rather than porous pots seems to rest in the fact that in tins it is easier to maintain a nearly constant moisture content without a rapid drying of the soil about the growing roots which naturally follow the horizontal water movement towards the side of the pot.

Finally, in regard to the influence of the presence of salts of tin and zinc, plants grown in untreated cans did better than those grown in cans of which the internal surfaces had been waxed. This result together with the fact established, chemically, that very dilute solutions of tin and zinc salts do have a stimulating influence on plant growth, would appear to be good evidence in support of the conjecture that the presence of these salts in the tin can, is a second beneficial factor which is absent in the case of its rival the earthernware pot.

A West Indian Court.

A communication has recently been received from the Secretary of the West India Committee with reference to the possibilities of arranging a West Indian Court at the First International Cotton and Tropical Products Exhibition to be held in June 1914. In this letter it is stated that the West India Committee will be glad to co-operate with the various Permanent Exhibition Committees in the West Indies, and with the Imperial Department of Agriculture, by taking charge of the Court, and by making the general arrangements as to details. It is further noted that the desirability of having a West Indian Court at the Exhibition has already received attention in the *Circular* of May 6, 1913. Further information is contained in the letter in reply to an enquiry by the Imperial Commissioner as to the cost per unit of space at the Exhibition. This is stated to be 4*s.* per square foot, and it is estimated that the minimum cost at which each individual Colony could participate would be £50. On the occasion of the Rubber Exhibition the general expenses and space occupied were as follows: Trinidad and Tobago £192, for 13 × 16 feet; Dominica, £49 16*s.*, for 10 × 10 feet; Jamaica £30, for 10 × 10 feet; British Guiana, £44 19*s.* 7*d.* (exclusive of space).

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Rubber in the Congo.

In an article appearing in *Diplomatic and Consular Reports*, No. 5043—Annual Series, results are given of the experimental work carried out in the Congo, in regard to the planting and maintenance of rubber vines. This is said not to have met with much success from a practical point of view. The Ireh, or Funtumia, was the first species tried, and great hopes were entertained as to its ultimate success; many plantations having been established in the Congo by the State, until there are now over 3,500,000 trees. Experiments were also made with *Hevea brasiliensis*, but this variety failed to give encouraging results, owing, it is believed, to incorrect methods of tapping. The results, however, obtained by the Malay States from Hevea have led to a re-awakening of interest among Congo planters in the cultivation of this rubber plant. The State-cultivated area has been increased from 2,920 acres in 1910 to 4,110 acres in 1911, and 780 acres of this area were planted with *Hevea brasiliensis*, the rest with Funtumia and *Manihot glaziovii*.

The results produced have been extremely variable, and in certain regions, such as the Mayumbe, the Funtumia does not seem to flourish well. All the experiments with it throughout have shown that it cannot be profitably tapped under the best conditions of cultivation before eight to ten years' growth. It grows best in regions where the rainfall does not exceed 45 to 55 inches, and on soil of a mixture of sand and clay. The coagulation of Funtumia latex appears to be more difficult than that of Hevea, and the use of acids does not give as a rule satisfactory results. Coagulation by precipitation in boiling water is the system which has given the best results in the Congo.

A new method of tapping by means of a series of small boxes set in a circle has been devised by a British expert now in the Congo, Dr. Christy, and is expected to yield results in tapping about double those secured by the vertical incision system. The average results obtained by the latter on the State plantations of Funtumia shows 31 lb. of rubber to the acre at one tapping of seven-year-old trees, whilst the Christy system can give as much as 97 lb. to the acre

The number of Manihot trees on the State plantations in 1908 was 205,081, in 1910 it had fallen to 125,032.

A further note on the cultivation of rubber in the Congo will be found in the *Agricultural News*, Vol. XII, No. 286, p. 124

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Fifth Annual Exhibition of the Colonial Institute of Marseilles.

On April 19, 1913, the Exhibition of coffees, cacaos, teas, vanilla and sugars which had been opened to the public during the past three months, came to an end. An account of the final proceedings including the distribution of prizes and awards, is dealt with at some length in *L'Expansion Colonial* for May 1913, and from this source the following notes have been abstracted.

A considerable part of the information directly concerns the West Indies. In the section dealing with the reports of the judges, the cacao sent from Martinique, which obtained a first prize, was described as being very well prepared and matured, having a clear light violet colour and wine-like flavour; it was a cacao that should readily find buyers. The Guadeloupe cacao which was also awarded a first prize was reported on as being composed of well-shaped beans, well fermented and perfectly mature with a clear brown colour; though a little acid, it possessed a good flavour.

Several remarks are made in the report upon the hybrid cacao sent from Réunion. This was stated to be very high class produce, and the report goes on to urge the necessity for the French tropical possessions, particularly in West Africa, developing their cacao industries in a parallel manner to that which has taken place in the Gold Coast Colony.

The formal lists of prizes at the end of the article shows that in regard to cacao, three out of the five *grands prix* were awarded to the French Antilles. As regards coffee, Guadeloupe obtained no less than three out of the six awards, and Martinique one. The gold medal for vanilla went to Guadeloupe, and of the prizes awarded for sugar, the first was obtained by Martinique.

In conclusion it may be remarked that at this exhibition the French Antilles appear to have met with very considerable success; this is particularly gratifying in view of the fact that they have had to compete with much larger possessions where agricultural production is conducted on a more extensive and perhaps better organized scale, thereby affording a greater range in the selection of the exhibits.

INSECT NOTES.

INSECTS LIABLE TO DISSEMINATION IN SHIPMENTS OF SUGAR-CANE.

The Bureau of Entomology of the United States Department of Agriculture, in Circular No. 165, discusses, from the point of view of the cane grower in America, the insects that are liable to be transported in shipments of sugar-cane, particularly in those intended for purposes of planting.

In the list of insects presented in the publication under consideration, there appear references to several species with which the West Indian planter is familiar; on the other hand, many are mentioned which do not occur in these islands. As regards classification, the pests of the sugar cane are grouped under two heads in this list: (1) those which are foreign to the United States, and (2) those which are native to that country.

The liability of insect pests to be transported in sugar-cane intended for planting is a subject worthy of very careful consideration. There have been in the past, instances in which the dissemination of pests by shipment has occurred, with the result that serious damage has been brought about. In the present consideration of the subject, it will be advisable to deal chiefly with those insects which occur in the West Indies, and to restrict our consideration of cane pests in other parts of the world to those which might be introduced with imported sugar cane.

MOTH BORERS. Perhaps the principal insect pest of sugar-cane in the West Indies—it is certainly the most widely distributed—is the moth borer (*Diatraea saccharalis*). This insect, probably a native of South America, is now known to occur throughout the sugar growing areas of tropical and sub-tropical America. The habit of the creature, in the larval stage, of boring into those parts of the cane which are used for planting, makes it especially liable to be transported in the manner under consideration, and it seems probable that its present distribution is to be accounted for in this way rather than as the result of migration

The giant moth borer (*Castnia licus*) is known as a pest of sugar-cane in British Guiana, and in Trinidad. The insect is a native of South America, its original food plants apparently having been orchids and orchid-like plants. In addition to sugar-cane, it is known to attack bananas. The larvae of *Castnia licus* bore into the canes from the base, extending their tunnels upward, for a distance, sometimes, as much as 2 feet, and also downwards into the underground portions of the plant. The tops are not affected, but they and the cane trash might harbour the eggs. The greatest care should be exercised in order to prevent the introduction of the giant moth borer into any new locality.

WEEVIL BORERS. The weevil borers, *Sphenophorus sericeus*, and possibly other species of the genus are of general occurrence throughout tropical America. There seems to be a strong opinion on the part of many planters that the weevil borers rarely if ever attack sound healthy canes. Any stems which have been injured by rats or by wind are liable to attack by these insects. It would seem, therefore, that perfectly healthy sound canes, such as should be chosen for planting, would not be likely to harbour the weevil borer.

THE FROGHOPPER. Froghoppers occur as a serious pest of canes only in Trinidad. These insects are often known as 'spittle insects' on account of the mass of froth in which the larvae live. Their natural food is one or another of the species of coarse grass, and they have adapted themselves to canes only after they have increased to considerable numbers on wild grasses near to the canes, when insufficient natural food compels a parasitic attack on the cultivated crop. Great care should be exercised to prevent the introduction of froghoppers into a new locality. They might not be able to establish themselves in all places as pests of sugar-cane, but the serious nature of their attacks in Trinidad where they have become established should be taken as a warning by all other sugar-growing districts. Froghoppers would probably not be transported with top cuttings since, for the most part, these insects occur on the roots and at the base of the plants on which they feed.

SCALE INSECTS AND MEALY-BUGS. There are two species of mealy-bugs and one scale insect of common occurrence in the West Indies, which may easily be transported with sugar-cane cuttings. The mealy-bugs are *Pseudococus calceolariae* and *P. sacchari*. The scale insect is *Aspidiotus sacchari*. It is probable that if these insects were not introduced into sugar-cane fields along with the plants, they would be of very rare occurrence, and it follows that the more carefully the plants are selected with reference to their freedom from the pests, the slighter will be the attack in the fields.

OTHER PESTS. Other insects related to those already mentioned occur in different parts of the world—moth borers and weevil borers, though not of the same species as our West Indian ones, are liable to be disseminated with shipments of sugar-cane. In the Hawaiian Islands the leaf-hopper (*Perkinsiella saccharicida*) has occurred as a very serious pest. This insect was undoubtedly introduced into those islands from Australia with shipments of sugar-cane. In Australia, leaf-hoppers are held in check by their natural enemies and they do not often cause serious injury to sugar-cane. For a number of years the losses in Hawaii, as a result of the attacks of leaf-hoppers, amounted to very large sums, but since the introduction of their natural enemies these insects have caused much less injury.

SOIL-INHABITING BEETLES. In the West Indies there are several species of beetles which attack the underground portion of the cane; some of these live in the soil and feed on the smaller roots, whilst others tunnel into the underground portions of the plant, eating out the interior, and sometimes extending their tunnels into the stems considerably above the ground-level. These are not likely to be transported with shipments of sugar-cane, but there is a possibility of this happening under certain conditions, and care should always be taken to guard against it. These soil-inhabiting beetles have been dealt with in recent numbers of the *Agricultural News* (see Vol. XII, Nos 285-90, March 29 to June 7, 1913) and they will be considered only briefly on the present occasion. The most important of these beetles is the brown hard back of Barbados (*Phytalus smithi*). This pest occurs only in Barbados and in Mauritius, as far as is known at the present time. In Barbados it is of little importance, being apparently well controlled by natural enemies; in Mauritius, on the other hand, it has been excessively injurious. The genus Phytalus is a South American genus, and *Phytalus smithi* has been known in Barbados for many years. Its recognition in Mauritius, however, extends back over a period of only five or six years, and there seems a very strong probability that this insect was introduced into Mauritius in shipments of sugar-cane for planting purposes. Other hard backs related to *Phytalus smithi*, which might be transported in the same way are *Lachnosterna patruelis* in St. Kitts, and *Lachnosterna* sp. in Antigua. The amount of damage done by these two insects is not known, but it is possible that if transported to a new locality they might become serious pests. In St. Croix (Danish West Indies), one of the rhinoceros beetles, *Strategus titanus*, occurs as a serious pest in certain years. This is an insect which, under normal conditions, is a scavenger in its habit of feeding, but it has adapted itself to feed on living plant tissue under the conditions existing in St. Croix. The insect tunnels into the base of the plant, and to some distance above the ground-level; but its tunnels are so large that there should be no chance of its escaping unnoticed in the case of sugar-cane cuttings. It might easily escape detection in soil, however, if this were used for packing sugar-cane. The same might be said of the root borers *Diaprepes abbreviatus* in Barbados, and *Exophthalmus esuriens* in the Leeward Islands. These insects attack the underground portion of the stem, eating out the interior, but they do not extend their tunnels into the cane above the ground level. The modern method of packing sugar canes for planting in damp charcoal is always to be preferred to the use of soil for this purpose. Not only do the canes arrive at their destination in better condition, but the danger is avoided of shipping soil-inhabiting insects, which might become serious pests under new conditions.

Bacteria in the Banana.—A summary of a recent investigation in America concerning organisms in the banana and the bio-chemical changes that take place during ripening is contained in the *Experiment Station Record*, Vol. XXVIII, No. 6. In this it is stated that the inner portions of the pulp of sound bananas are practically sterile, but that the regions of the inner coats of the peel may be sparsely inhabited by bacteria. These are held in check during the normally ripening processes, but subsequently they find conditions favourable to growth. Since the protective covering of the fruit is able to resist the invasion of bacteria, the investigator was led to believe that the most probable channel of entrance would be the circulation of the plant juice, and suggests that infection occurs while the fruit is still on the tree. This does not appear to have been entirely confirmed by experiment, and seems to be well worth continued investigation. The limited experiments with the organism of decay does not justify the conclusion that it is a specific for banana tissue. It can be said, however, that the bacillus readily produces decay, and, to the extent of the trials described, exhibits a marked tendency towards the specific character.

With reference to the studies on ripening, the following facts are of interest. It seems that one essential change during the ripening of the banana is the conversion of starch into soluble carbohydrates, which consist principally of cane and invert sugars and dextrins. Maltose is not produced. The enzyme amylase is present in the early stages of ripening and persists even in the over-ripe fruit. No evidence of the existence of dextrinase or lactase was obtained, but a protease was present and oxidase was found during all stages of ripeness investigated. Sucrase is present in the unripe stage but is much more intense in the ripened fruit. Alkalinity retards or inhibits its action. The hydrolysis of raffinose by banana tissue was demonstrated conclusively.

CASTILLOA RUBBER IN DOMINICA.

The eighth quarterly tapping of Castilloa trees in the Dominica Botanic Gardens having recently been completed, the Curator (Mr. Joseph Jones) has furnished this Department with information embodying the results that have been obtained.

It was found that the average yield per tree in four quarterly tappings during 1911 was for the twenty-one-year old trees, 1 ℔. 7 oz.; for the fourteen-year-old trees, 0 ℔. 2·7 oz.; for the thirteen-year-old ones, 0 ℔. 3·3 oz. During 1912 the corresponding yields were respectively 0 ℔. 10¾ oz., 0 ℔. 1 oz., 0 ℔. 1·1 oz.

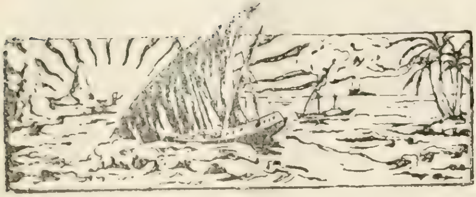
The girth of the trees and the number experimented on can be seen from the following table:—

No. of trees.	Age, years.	Average girth 3 feet from ground.	
	1912.	1911.	1912.
4	21	7 ft. 4 in.	7 ft. 6½ in.
9	14	3 ,, 1 ,,	3 ,, 4½ ,,
37	13	3 ,, 0 ,,	3 ,, 6 ,,

It will be observed that the yield was much greater during 1911 than during 1912, though even during 1911 it was very low. The species of Castilloa grown in Dominica thrive well, particularly on the coast lands, but the above tapping experiments would appear to indicate that these trees cannot be recommended for extended cultivation. The latex, however, is of good quality. Samples analysed at the Government Laboratory, Antigua, contained about 86 per cent. of caoutchouc and from 9 to 12 per cent. of resin, compared with 93 and 47 per cent. of caoutchouc, and 3 to 4, and 50 per cent. of resin, in samples of locally produced Para and *Funtumia Africana*, respectively.

Utilization of Hawaiian Products.—Dr. E. V. Wilcox, Director of the Hawaii Experimental Station, has recently sent to a firm of paper manufacturers in the United States a supply of pine-apple leaves, and this firm has made a favourable report on the fibre produced from them. It is found suitable for a kind of tough paper used for insulating purposes. It has been proved that the fibre can be produced with the machinery for making sisal fibre. Seventy pounds of fibre to the ton of pine-apple leaves can be produced, which at 14 tons of leaves would be 1,000 ℔. of fibre to the acre. At a profit of only one halfpenny a pound this means £2 an acre for what is now waste. Dr. Wilcox is stated also to have received reports from manufacturers of varnish in various cities, upon samples of kukui-nut oil sent from the Hawaii Experiment Station. They are to the effect that it is far better than linseed oil for making varnish. Honolulu at present imports 50,000 gallons of linseed oil each year. Experiments are being made to produce a press to extract the oil. (From the *Journal of the Royal Society of Arts*, May 2, 1913.)

A copy of the Imperial issue of the *Financier and Bullionist* has just been received. This publication constitutes the largest penny daily newspaper ever published in the United Kingdom. A page with illustrations is devoted to a description of West Indian affairs and a large amount of valuable matter is presented in connexion with industrial progress in Canada, Australia, South Africa and other regions of the British Empire.



GLEANINGS.

The first edition of the prospectus for the Fourth International Rubber and Allied Industries Exhibition (1914) has recently been received at this office.

The fibre plant, *Calotropis procera*, one of the Asclepiadeae, called sometimes in the West Indies, French cotton, has been found to contain the active principle called calotropin, which belongs to the drugs that act on the heart like digitalis. (From the *Journal of the Chemical Society*, April 1913.)

The attention of planters and others may be directed to the Annual Report on the Peter's Hall Medical District, Demerara, for the year 1911-12. It has recently been published in the form of a Circular in the *Official Gazettes* of the various Colonial Governments.

It is stated in the *Louisiana Planter* for April 19, 1913, that a certain organization in Germany is planning to have a course of study for sugar factory managers and superintendents. During the summer months, special lectures will be delivered on the economics of the sugar industry.

It is stated in *Diplomatic and Consular Reports*, No. 5060—Annual Series, that in connexion with the trade and commerce of St. Pierre and Miquelon, it is interesting to note that a considerable quantity of flour, tinned provisions and West Indian rum is imported from Halifax, Nova Scotia.

A recent press bulletin of the Hawaii Agricultural Experiment Station advocates the manufacture of silage for stock-feeding purposes in that territory. Among the crops that are recommended for use are the following: maize, cane tops, sorghum, marsh rice, velvet beans, soy beans and cowpeas.

According to *The Board of Trade Journal* for May 8, 1913, the quantity of rubber exported from Para, Manaos, Iquitos and Itacoatiara during the first quarter of 1913 was, to the United states, 5,683,882 kilos.; to Europe, 8,445,168 kilos., making a total of 14,129,050 kilos. (1 kilo. = 2·2046 lb.)

The result of the Trinidad cacao prize competition is given in the *Port-of-Spain Gazette* for May 28, 1913. These competitions appear to be a successful means of improving the cacao cultivation of the Trinidad peasantry. Already forty-three prizes of a total value of $1,634 have been awarded to successful competitors. The highest prize was $96.

Information has been received from the Curator of the Botanic Station, Antigua, to the effect that the young cane crop in that island is decidedly healthy, and more promising in appearance than it has been, at this time, for some years. The demand for lime and coco-nut plants in Antigua is small compared with that of last year, though several lime nurseries are laid out in various parts of the island.

It is stated by the Curator of the Botanic Gardens, Dominica, that the Easter cacao crop in that island is now over and that, as regards limes, the outlook is promising. Green limes are selling at 10*s.* to 12*s.*, unpacked. During the month of May the following plants were distributed from the gardens: limes, 5,268; Para rubber, 100; budded citrus, 22; grafted mangoes, 8; miscellaneous, 12; making a total of 5,410.

An interesting account is given in the *Gardener's Chronicle* for May 17 of the digestive juices of plants. It is pointed out that any of these enzymes are much more powerful than those of animal origin. Thus a mixture of diastatic and proteolitic enzymes, which may be obtained easily from the latex of the fig (*Ficus Carica*) has been shown to act on proteins twice as vigorously as the ferment which occurs in the intestines of animals.

An interesting comparison of sugar production in Louisiana and Cuba is made in the *American Sugar Industry* for May 1913 An average of five years' figures shows that in Louisiana, 161·9 lb. of sugar goes to the ton of cane, as against 229·3 lb. to the ton in Cuba—a difference of 67·4 lb. in favour of Cuba. The extraction was 16 per cent. in Cuba as compared with 11·5 per cent. in Louisiana.

In regard to the influence of potash on the elaboration and degradation of carbohydrates in the higher plants, it is stated in the *International Sugar Journal* for May 1913, that an investigation has shown that potash is indispensable for the elaboration of carbohydrates, for the process of physiological combustion, for the transition of substance in the chlorophyll-containing and chlorophyll-free cells. This fact is interesting, in view of the circumstance that large amounts of potash have not been found necessary for the production of sugar by the sugar-cane.

Notice of Judgment No. 2169 of the United States Department of Agriculture concerns a case of adulteration and misbranding of Jamaica ginger. The product was labelled: concentrated essence of Jamaica ginger. Analysis of a sample of the product by the Bureau of Chemistry showed the following results: specific gravity at 15·5°C. 0·8890; non-volatile solids, grammes per 100 c.c. 0·969; ash, grammes per 100 c.c 0·123; alcohol by volume, 67·4 per cent.; La Wall's test for capsicum, positive; Nelson's test for capsicum, positive; Seeker's test for ginger, positive; caramel, none. Adulteration and misbranding of the product were alleged in view of the fact that an appreciable quantity of capsicum had been substituted for Jamaica ginger, and because of the presence of 60·4 per cent. of alcohol, the proportion of which was not declared on the label.

STUDENTS' CORNER.

JUNE.

Second Period.

Seasonal Notes.

During May, in several of the islands, the pollination of vanilla will have formed an interesting feature of current agricultural operations. The student has, in some instances, obtained practical experience in this work. Notes should be made as to the details of the methods employed. An instructive procedure would be to construct diagrammatic drawings of the unfertilized ovary, and of this organ during its development into a fruit.

Attention should be given to those facts that will have to be borne in mind during the curing of the pod. (Is the vanilla fruit strictly speaking a 'pod'?) For how long should the pods be scalded in water? How are the pods dried, and what are the characters of the well-fermented fruit? Recent and important information on vanilla will be found in the *Agricultural News*, Vol. XII, p. 116, and in the Report on the Agricultural Department, Dominica, 1911-12. What is vanillin? Does coumarin possess any economic significance in regard to this substance? (See *Agricultural News*, Vol. XII, p. 47 [West Indian Products], and p. 116).

The student—particularly the intending final or intermediate candidate—should direct his attention to the forthcoming Exhibitions in Great Britain and Canada.

Information should be obtained as to what is being done locally in regard to the Canadian National Exhibition (see *West Indies in Canada*, 1912) and in regard to the Colonial Section at the Royal Agricultural Society's Show at Bristol. What do you know of the arrangements that are likely to be made in connexion with the International Rubber Exhibition, to be held in London, early in 1914? What kind of organization is the International Association of Tropical Agriculture, which will meet at the same time?

Exhibitions afford a means of advertisement, not only for the individual estate but for the whole island, and in a wider sense, of the entire region. They further, induce healthy competition in regard to excellence of production, and finally, they aid in the matter of keeping producer and manufacturer in touch with one another.

Questions for Candidates.

Preliminary Questions.

(1) Given normal weather conditions, state approximately how many inches in height a cotton seedling grows during a period of one month.

(2) Are Gru-Gru nuts of any value?

Intermediate Questions.

(1) Write a short account of the cultivation and preparation for market, of vanilla.

(2) Contrast the characters of the lint of Sea Island, Marie Galante, and Sakellarides cotton.

Final Questions.

(1) Explain the differences between the activities of the International Bureau of Agriculture, Rome, and those of the International Association of Tropical Agriculture.

(2) Write from memory a short account of the chief root borers and other grubs in West Indian soils. Explain the extent of the damage they inflict.

LIVE STOCK NOTES.

THE CARE OF EGGS.

An extensive investigation has recently been made by the Bureau of Animal Industry, United States Department of Agriculture, into the different environmental conditions which affect the deterioration of eggs. The information is published in Bulletin 160 of the Bureau mentioned. The conclusion is reached that the greatest deterioration in fertile eggs occurs when they have undergone a certain amount of natural incubation, as for example, in the nest of layers. It is strongly emphasized that infertile eggs, regardless of where they may be kept, are much more resistant to deterioration than fertile ones. In fertile eggs, the development of the embryo after twenty-four hours of incubation, was of sufficient proportion to be recognized when held before the candle, and at the expiration of thirty-six hours, the presence of blood was easily detected. In infertile eggs, under the same conditions, a slight shinkage of the contents was the only change which could be recognized by the eye. The results of all experimental work point to the fact that the production of infertile eggs is the greatest asset in the attempt to produce high quality marketable eggs during hot weather. The summary to the bulletin concludes with the following five rules: (1) give the hens clean nests, (2) gather eggs at least once daily, (3) keep the eggs in a cool dry place, (4) dispose of the eggs at least twice a week, (5) kill or sell all mature male birds as soon as the hatching season closes.

Maize for Dairy Cows.—An article entitled the preservation and use of maize for stock feed which is appearing in instalments in the *Agricultural Journal of the Union of South Africa*, contains some interesting quotations about maize as a food for dairy cows. It is pointed out first that since milk production calls for a large amount of protein in the ration and as maize grain is, though exceedingly palatable to cows, a foodstuff rich in carbohydrates but poor in protein, it should not, therefore, form more than one-half or three-fifths of the concentrated food given to a cow. The following ration per head per day is taken from the article referred to, as likely to prove of interest to stock feeders in the West Indies: maize silage 35 lb.; maize and cobmeal 3 lb.; hay 10 lb.; bran 3 lb; cotton-seed meal 2 lb.; Chicago gluten meal 2 lb.

Information is contained in *Diplomatic and Consular Report*, No. 5049—Annual Series, which shows that owing to their immunity from Texas fever, Indian cattle were being rapidly imported into Brazil during 1911. This breed, however, is not now considered satisfactory stock, and the Government is determined not to give any assistance in the way of introducing it. Among European cattle the mortality from Texas fever is very heavy, and farmers consider the grant from the Government too small in comparison with the risk they run in acclimatizing the animals.

One case of anthrax in a calf has occurred in St. Vincent during the month of May 1913. The total number of deaths from other causes amongst domesticated animals in that island was eighty-six.

FUNGUS NOTES.

THE PANAMA DISEASE OF BANANAS.

Those who are interested in the cultivation of bananas will be aware of the existence of the Panama disease, of its infectious nature and devastating effect, and of the controversy that has arisen as to the identity of the causative organism in different parts of the Western Tropics. It may be remembered that the subject was dealt with at considerable length in the *Agricultural News*, Vol. XI, pp. 126, 127, 142 and 143, where available literature on the disease was summarized and discussed by the then Mycologist to this Department.

One of the latest additions to the literature on the subject is a paper in the *Bulletin of the Department of Agriculture*, Jamaica, for January 1913, which describes an investigation of the disease in that Colony, by S. F. Ashby, B.Sc., the Government Microbiologist.

It appears, from this paper, that the typical symptoms of Panama disease were first observed in Jamaica early in 1912. The cases were of a sporadic nature. Referring to the external signs observed, it is pointed out that the yellowing of the leaves and their eventual breakage from the main axis, cannot be relied upon in view of the fact that such symptoms can often be attributed to drought. A great deal of attention is given, therefore, to the internal symptoms and to the study of the characteristics of the organism which was isolated.

In regard to the former aspect, it is stated that a section across the bulb or head of a diseased sucker will show minute discoloured dots corresponding to the positions of the vascular strands. The colouring may be yellow, orange, claret-red, purple-red, and in advanced stages dark-brown. The writer was able to trace in some cases the discoloured bundles from the bulbs of the affected suckers through the connecting necks into the parent root-stocks.

The examination of diseased tissue microscopically revealed colourless septate hyphae closely adpressed to the inner walls of the vessels. Hyphae could not be seen outside the vessels. Microconidia were also present in the vessels, but were never observed in quantity sufficient to lead to the view that they caused serious obstruction.

Cultures were made from different parts of diseased tissue—from bulbs, roots, leaf-sheaths and stalks, with strands in all stages of discoloration; and they always yielded the same fungus. This organism was seen to have a typical star-like appearance when grown artificially on media. It produced three forms of spore-bodies: (a) microconidia (similar to those observed in the vessels) formed near the surface or under the surface of the medium, (b) macroconidia, being, when mature, four-celled, sickle-shaped and much larger than the microconidia, (c) chlamydospores or gemmae (resting spores).

The author therefore describes the fungus as a Fusarium, the microconidia being the Cephalosporium stage. That no perithecial stage was obtained will be carefully noted, since this circumstance provides the chief point in which Ashby's results disagree with those of Drost in Surinam.

As well as isolating the parasite just referred to, Ashby found another Fusarium on decayed banana plants free from symptoms of Panama disease. This organism was grown in culture and its characteristics determined with sufficient accuracy to render the two fungi distinguishable. They are apparently different species. The Panama disease Fusarium (Fusarium A) differed markedly from the saprophyte (Fusarium B) by not developing a typical Cephalosporium stage, nor sclerotia. An important diagnostic feature is the fact that the waxy masses of conidia of species B become dark-blue, especially on bananas, and look very like the similarly coloured sclerotia of species A.

No inoculation experiments have yet been performed with either fungus.

Leaving the purely botanical observations, and passing over the author's discussion of the literature on Panama disease*, attention may be given next to the treatment and prevention of the disease.

As in most other diseases, once the fungus has gained entrance little can be done to save the plant. The effect of the fungus is to choke the vessels thereby curtailing the plant's water-supply. It is also believed that a toxin or poison is secreted by the organism. The fact remains that preventive measures only are of use. Of these, the cultivation of resistant varieties may be considered first. In this connexion, the author advocates the planting, in infected areas, of the Silverskin and Apple bananas, which are edible varieties, and although susceptible, are much less so to the disease than Gros Michel. Reference is next made by the author to the proclamation issued in June 1910 forbidding the importation of banana plants or labourers' implements from Trinidad and Central and South America.

As regards the destruction in Jamaica of diseased plants, it is stated that the boundaries of the affected areas are fixed at a distance of one chain from the nearest diseased stool: each tree is cut down and repeatedly charred and then buried in freshly slaked lime. Although the destruction of the plants in this way was as thorough as could be reasonably expected, enough infected material remained to make replanting undesirable for a time. A small plot on one area was railed off and replanted six months ago; a number of the young suckers have already shown signs of the disease. The question is raised as to whether the Fusarium can live in the soil as a saprophyte. The presence of sclerotia would lend to support this speculation.

In conclusion, the writer appears to attach sufficient importance to such outbreaks as have already occurred in Jamaica as to advocate the introduction of the Congo banana, and the hardy, but much maligned dwarf banana, called 'Governor' in Trinidad, which, though somewhat coarse, is a heavy yielder, and can be carried successfully uncrated from the West Indies to England, and be readily accepted by importers.

New Exotic Fungi.—It is stated in the *Kew Bulletin*, No. 3, 1913, that six new fungi from various parts of the Tropics have recently been identified at Kew. Of those which are likely to be of the greatest interest in the West Indies may be mentioned *Glœosporium cocophilum*, Wakefield, which was collected by Mr. F. W. South, B.A., late Mycologist of this Department, in St. Vincent, on the petiole of the coco-nut palm (*Cocus nucifera*). The second one of interest is an Ascomycete, identified as *Apiosporium atrum*, Massee. This organism was sent from Kuala Lampur F.M.S., by Mr. C. K. Bancroft. It was found on the dead branches of Para rubber trees but is not considered as a parasite. Three of the new fungi described, developed on a small piece of cattle dung forwarded from Singapore, Straits Settlements, by Mr. I. H. Burkill.

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* It may, however, be noted in this connexion, that Ashby regards the disease in Surinam as identical with that in Panama, Costa Rica, Jamaica and Trinidad, and probably with that in Cuba.

An interesting note appears in the same publication in connexion with *Isaria Pattersoni*, Massee. This fungus was erroneously stated to be indigenous to the Gold Coast, the material having been received from that Colony without definite information. The Kew authorities, however, have learnt from Mr. Patterson, Government Entomologist, Gold Coast Colony, that the organism was collected in the island of St. Vincent, West Indies, on the Pentatomid, *Nezera viridula*. Specimens of the fungus were recently received at Kew from the island of Grenada through the Imperial Department of Agriculture for the West Indies.

A new process of timber preservation is described in the *Experiment Station Record*, Vol. XXVIII, No. 6. The preservative is melted paraffin with suspended silica, combined with a certain percentage of naphthalin. It is stated that the naphthalin causes expansion of the pores and ducts of the wood which expels the moisture and draws in the preservative mixture. On cooling, the mixture forms a solid coating over the interior ducts and pores. Tests show that it does not leak out, that it is impervious to water and all organic acids, and that it prevents the entrance of bacteria and fungi, which destroy the wood tissue.

With reference to Fungus Notes which appeared in the current volume of the *Agricultural News*, p. 174, the statement was made that the Colletotrichum disease of sisal hemp appeared to have not been noticed or described in the West Indies. A communication recently received from Mr. J. B. Rorer, A.B., M.A., Mycologist to the Board of Agriculture, Trinidad, indicates certain references which were overlooked in the preparation of the article. The disease has been observed in Antigua, and in Trinidad.

THE EFFECT OF PARTIAL STERILIZATION OF SOIL.

The following summary of a recent paper, by Russell and Hutchinson of Rothamsted Experimental Station, published in the *Journal of Agricultural Science*, for March 1913, is taken from the *Journal of the Board of Agriculture* for May 1913:—

This communication forms the second part of the report on an investigation of the zoological inhabitants of the soil, which was suggested by the increase in bacterial activity and consequently in the production of plant food in the soil subsequent to the partial sterilization of the soil by heating, or by the use of certain drugs. The authors consider that the conclusions reached previously have been confirmed and extended by the continuation of the work. Fresh evidence is adduced that bacteria are not the only inhabitants of the soil, but that another group of organisms occurs, detrimental to bacteria, multiplying more slowly under soil conditions, and possessing lower power of resistance to heat and antiseptics. In consequence of the presence of these detrimental organisms the number of bacteria present in the soil is not dependent merely on the temperature, moisture content, and other conditions of the soil. It may indeed show no connexion with them; thus rise of temperature may be accompanied by a rise in the number of bacteria, or a fall, or the number may be unaffected; increase in moisture content has also proved without action. The number of bacteria depends on the difference in activity of the bacteria and the detrimental organisms.

When soil has been partially sterilized, however, the detrimental organisms are killed and the bacteria alone are left. It is found that increase in temperature, up to a certain point favours bacterial multiplication.

The detrimental organisms are killed by any antiseptic vapour, such as that of toluene, or heating the soil to 55° to 60° C.; they suffer considerably when soil is maintained at even lower, but still higher than the normal, temperatures (e.g., 40° C. for a sufficient length of time). Cooling to low temperatures also depresses them, although it fails to kill them.

Once the detrimental organisms are killed, the only way of introducing them again is to add some of the untreated soil. But the extent of the transmission is apt to be erratic, being sometimes more and sometimes less nearly complete than at others. The precise conditions governing the reintroduction have not yet been learned.

The authors provisionally identify the detrimental organisms with the active protozoa, but as the zoological survey of the soil is yet incomplete, they do not commit themselves to any particular organism or set of organisms, or to any rigid and exclusive definition of the term protozoa.

The increase in the number of bacteria following partial sterilization by volatile antiseptics is accompanied by an increase in the rate of ammonia production until a certain amount of ammonia or of ammonia and nitrate has accumulated, when the rate falls. Thus two cases arise: (1) when only small amounts of ammonia and nitrate are present; here the increase in the number of bacteria following on partial sterilization causes a corresponding increase in the amount of ammonia and nitrate; (2) when large amounts of ammonia or of ammonia and nitrate are present, the increased numbers of bacteria then causing no corresponding increase in the amounts of ammonia and nitrate. There is a fairly well-marked limit beyond which the accumulation of ammonia and nitrate will not go, although bacterial multiplication may still continue. The limit varies with the composition and condition of the soil.

Complications are introduced when the soil has been partially sterilized by heat, because heat affects an obvious decomposition of the organic matter, thus changing the soil as a medium for the growth of micro-organisms. The bacterial flora is also very considerably simplified through the extermination of some of the species. These effects become more pronounced as the temperature used is higher, and the tendency is to reduce the numbers of bacteria. Maximum numbers of bacteria are found in soils that have been heated to the lowest temperature necessary to kill the detrimental organisms (about 60°C.). In this case the bacterial numbers and the rate of decomposition are similar to those in soils that have been treated with volatile antiseptics, and the relations between the numbers of bacteria and the decomposition noted under (1) and (2) above also hold. No relation was found, however, between the numbers of bacteria and the decomposition in soils that had been heated to 100°C. In this case, although the number of bacteria was at a minimum, the decomposition effected was at a maximum. When the bacteria are re-introduced into the partially sterilized soil by the addition of untreated soil, a still further production of ammonia and nitrate is brought about, unless too large a quantity of those substances is already present; but the depression in bacterial numbers that follows, owing to the detrimental organisms being re-introduced at the same time, generally does not check the decomposition owing to its having already gone near to the limit before the check could take effect.

MARKET REPORTS.

London.—The West India Committee Circular, June 3, 1913.

Arrowroot—3¾*d.* to 5*d.*
Balata—Sheet, 2/9; block, 2/- per lb.
Beeswax—No quotations.
Cacao—Trinidad, 70/- to 77/- per cwt.; Grenada, 64 6 to 70/-; Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—West Indian, £29 10*s.* to £29 15*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 16½*d.* to 19*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 1/6 to 1/8; concentrated, easier; otto of limes (hand-pressed), 14/.
Logwood—No quotations.
Mace—1/10 to 2/10.
Nutmegs—5½*d.* to 5¾*d.*
Pimento—Quiet.
Rubber—Para, fine hard, 3/8; fine soft, 3/7; Castilloa, 2/9 per lb.
Rum—Jamaica, 2/3 to 6/- per gallon.

New York.—Messrs. Gillespie Bros. & Co., May 29, 1913.

Cacao—Caracas, 14c. to 15c.; Grenada, 13⅝c. to 14½c; Trinidad, 14c. to 15c; Jamaica, 12c. to 13¾c.
Coco-nuts—Trinidad and Jamaica, selects, $38·00 to $39·00; culls, $24·00 to $25·00 per M.
Coffee—Jamaica, 12c. to 14c. per lb.
Ginger—7¾c. to 10½c. per lb.
Goat Skins—Jamaica, 50c.; Antigua and Barbados, 48c. to 50c.; St. Thomas and St. Kitts, 44c. to 46c. per lb.
Grape Fruit—Jamaica, $2·75 to $4·00
Limes—$8·00 to $10·00
Mace—50c. to 57c. per lb.
Nutmegs—110's, 13c.
Oranges—Jamaica, $3 00 to $3 50 per box.
Pimento—4⅛c. to 4¼c. per lb.
Sugar—Centrifugals, 96°, 3 33c. per lb.; Muscovados, 89°, 2·83c.; Molasses, 89°, 2·58c. per lb., all duty paid

Trinidad,—Messrs. Gordon, Grant & Co., June 9, 1913.

Cacao—Venezuelan, $15·50 per fanega; Trinidad, $15·00 to $15·50 per fanega.
Coco-nut Oil—$1·19 per Imperial gallon.
Coffee—Venezuelan, 15c. per lb.
Copra—$4·75 per 100 lb.
Dhal—$4 25 to $4·50
Onions—$1·00 to $1·50 per 100 lb.
Peas, Split—$6·20 to $6·25 per bag.
Potatoes—English, $2·00 to $2·50 per 100 lb.
Rice—Yellow, $5·40 to $5·50; White, $5·75 to $6·00 per bag.
Sugar—American crushed, no quotations.

Barbados,—Messrs. James A. Lynch & Co., Ltd., June 14, 1913; Messrs. T. S. Garraway & Co., June 7, 1913; Messrs. Leacock & Co., June 6, 1913.

Arrowroot—$6·00 to $7·00 per 100 lb.
Cacao—$13·00 to $14·00 per 100 lb.
Coco-nuts—$18·00
Hay—$1·30 to $1·50 per 100 lb.
Manures—Nitrate of soda, $70·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $82·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$1·20 to $2·00 per 100 lb.
Peas, Split—$6·00 to $6·25 per bag of 210 lb.; Canada, $5·50 to $6·00 per bag of 120 lb.
Potatoes—Nova Scotia, $2·25 to $3·65 per 160 lb.
Rice—Ballam, $5·05 to $5·40 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $4·00 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, June 7, 1913; Messrs. Sandbach, Parker & Co., May 9, 1913.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	8c. per lb.	——
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	——
Cacao—Native	15c. to 16c. per lb.	19c. per lb.
Cassava—	72c.	——
Cassava Starch—	$5·00 to $6·00	——
Coco-nuts—	$16 to $20 per M.	$10 to $16 per M.
Coffee—Creole	17c. to 18c. per lb.	18c. per lb.
Jamaica and Rio	18c. per lb.	19c. per lb.
Liberian	13½c. per lb.	12c. per lb.
Dhal—	$3·54 to $4·00 per bag of 168 lb.	$3·75 to $4·00 bag of 168 lb.
Green Dhal	$5·00	——
Eddoes—	60c. to 84c.	——
Molasses—Yellow	None	——
Onions—Teneriffe	5½c to 6c.	——
Madeira	——	——
Peas—Split	$6·50 per bag (210 lb.)	$7·50 per bag (210 lb.)
Marseilles	$3·75 to $4·00	——
Plantains—	16c. to 40c.	——
Potatoes—Nova Scotia	$2 00 to $2 25	$2·40
Lisbon	——	——
Potatoes-Sweet, B'bados	96c. per bag	——
Rice—Ballam	No quotation	——
Creole	$4 75 to $5·00	$5 00
Tannias—	$1·20	——
Yams—White	$1·68	——
Buck	$1·44	——
Sugar—Dark crystals	$2·20 to $2·25	$2·30
Yellow	$3·00	$3·25
White	$3·75 to $4·00	$5·00
Molasses	$2 00	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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Indian Corn as a Crop in the West Indies.

DURING recent years it has become more and more recognized that a diversification of crops gives to any agricultural district or community a stability which is lacking where only one crop is cultivated. To cite concrete examples, reference may be made to the condition of the sugar industry in the West Indies before the breakdown of the Bourbon cane from the attacks of fungoid disease, and to the cotton industry in the United States before the advent of the cotton boll weevil. In both these instances the ultimate result, however, has been of benefit. In the West Indies, the cultivation of cotton has been taken up and a profitable industry established, whilst in the United States, there has followed on the attacks of the boll weevil a tendency to reduce the area under cotton, and to practise a more intensive cultivation of this in rotation with other crops.

Indian corn is a commodity of great importance in the West Indies; not only is it largely used in the feeding of estate animals and poultry, but it also forms a considerable portion of the staple food of the labouring classes. The islands consume far more than they produce. In Barbados, alone, the values of the importation of corn and corn meal amounted in 1911 and 1912 to a total of £73,198. In 1911, 33,811 barrels of corn valued at £25,045, and 3,119,490 lb. of corn meal worth £3,383 were imported, whilst in 1912, 35,946 barrels of corn meal valued at £29,807, and 3,752,740 lb. of corn worth £9,963 were received. In addition to the imported corn and corn meal that is consumed in Barbados, it must be borne in mind that a very considerable amount is produced locally, the quantity and value of which it is impossible to estimate, since it is grown by peasants chiefly, though also as a catch crop on large estates.

The figures given above concerning the value of the Indian corn and Indian corn meal, will perhaps come somewhat as a surprise to many; but when these values are compared with those brought forward for the cotton industry in the West Indies, possibly the surprise of the reader may change into astonishment.

In a recent number of this journal* was published a review of the West Indian cotton-growing season of 1911-12, and by reference to the figures there presented it will be observed that only one of the West Indian islands exported cotton of an estimated value greater than the value of the imported corn and corn meal into Barbados during the same year. This island was St. Vincent, with an export value of cotton amounting, in round numbers, to £40,500. If the figures for Barbados be consulted, it will be seen that [the value of the cotton produced in that island was not as much as that of the corn and corn meal imported. The 1911-12 crop of cotton in Barbados was of an estimated value of £28,112, whilst the value of the corn imports was, in 1911, £33,428. In comparing the value of the cotton returns in other islands with those for imported corn into Barbados differences as regards population, of course, render a strictly parallel comparison impossible, nevertheless the contrast helps to emphasize the importance of corn as a necessary commodity in these islands.

Turning from these statistical considerations, it will be desirable next to deal with matters concerning the actual cultivation of Indian corn. In Barbados, to refer again to the conditions in that island, Indian corn is grown chiefly as a catch crop, planted at wide intervals, in the expectation that the yield will be some 8 or 10 bushels per acre. There is no doubt, however, that if planted closer, corn might be made to yield from 40 to 50 bushels per acre, and, in fact, yields approaching these figures have already been obtained in the Leeward Islands in experimental trials.

To continue the subject in more detail, some of the advantages, from an agricultural point of view, attendant on the growing of Indian corn may be next considered. In the first place, the crop is one that occupies the land for only a short time—about three months as a rule;—it is a useful change plant in a rotation system; the cost of cultural operations after planting is small, and on many estates all, or nearly all the work of tillage might be performed by animal-drawn implements.

But the crop possesses disadvantages as well. Corn is rather a gross feeder, and will give the best results only when the soil is well-prepared and enriched by a fairly large amount of pen manure or organic matter; corn, it is generally believed by planters, makes a very strong demand on the moisture of the soil, and when used as a catch crop immediately preceding canes, sometimes dries out the soil sufficiently to affect adversely the growth of the following crop. Moreover, corn is attacked by some of the insect pests and fungoid diseases that infest canes, and by certain insects that also attack cotton, i.e. the cotton boll worm and the corn-ear worm.

The principal objection, however, on the part of planters to the production of corn on a large scale has been the difficulty in curing and storing the grain If harvested in wet weather the corn has a tendency to mildew, especially if reaped before becoming fully ripe, and, later, the stored grain is open to the attacks of several species of grain-infesting insects.

In an article on another page of the present number of this journal there will be found an account of the process of curing grain known as kiln-drying. This ingenious process makes it possible to provide for the curing and storing of crops of corn in such a manner as to entirely eliminate what is actually the principal objection to Indian corn as a crop in these islands.

The investment of capital in newly introduced concerns demands a cautious attitude. Nevertheless, the success, for instance, of co-operative cotton factories should be an encouragement towards the establishment of co-operative corn factories; for in these the corn, as soon as harvested, might be dried and stored, and if subsequently attacked by weevils and other pests, the grain could easily be passed again through the driers and the insects exterminated at the beginning of the attack.

As a result of adopting such a system as this an excellent quality of locally grown corn might always be available for local consumption, and, possibly, in certain islands, for export to other colonies as well. The expenditure on imported corn would thus be largely reduced, and an important asset added to the agricultural resources of the West Indies. Incidentally, the better quality of the locally grown grain would be likely to produce important improvements in the condition of corn-fed animals, and, last but not least, in the health and vigour of those people who use considerable amounts of corn for food.

An important consideration not to be lost sight of in the development of this industry is the bearing on the yields, and consequently on the profits to be derived, from careful selection of the seed corn. This might be done on a fairly large scale, in the first instance, in the 'corn factory' where the best ears could be saved for planting. Later, systematic selection on the estates should serve to increase the benefits derived from this system. The cotton industry itself furnishes good examples of the benefits to be derived from selection of seed, and also indicates the lines on which similar work might be carried out with the crop in question.

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*Vol. XII, p. 22.

Finally, in addition to curing and storing grain, the corn factory might also be augmented with machinery for grinding, thus providing the means for producing an excellent quality corn meal, from which a mixed feed (i.e. corn and oats ground together) could also be easily and satisfactorily prepared.

THE AGRICULTURAL BANK OF EGYPT.

An article is published in a recent number of the *Tropical Agriculturist* (April 1913), on the object and the work of the Agricultural Bank of Egypt, from which the particulars given below are summarized for the benefit of readers of the *Agricultural News*.

THE BANK AND MONEY-LENDERS

The Agricultural Bank of Egypt was established by Lord Cromer some fifteen years ago in order to free the improvident fellah from the clutches of the Greek and Syrian money lender, who, taking the fellah's land as security, advances him money at the rate of anything between 30 to 50 per cent. or more. The Bank was given the support of the Government inasmuch as that it allowed the instalments, when due, to be collected by the Government tax-collectors at the same time as the taxes were collected in the villages after the cotton harvest in October and November. The Bank has a Board of Directors in London and Egypt, and a General Manager and head office in Cairo.

LAND VALUE AND CREDIT.

According to the statutes of the Bank, no client can borrow more than £E 500 on the mortgage of his land, and repayable at the fixed rate of interest of 8 per cent. in ten yearly instalments. This was subsequently altered to twenty years, and a rate of 9 per cent. for those in arrears of payment.

As only about 75 per cent. of the fellaheen own more than 5 acres, nearly all the Bank's work is done with the small land-owner, even so small a portion as ¼-acre being accepted as security. Land, however, is of very high value in Egypt: no land that will bear even a poor crop of cotton can be purchased for less than £E 40; and in the older Provinces, where the soil is very rich, nothing can be bought under £E 120, and anywhere near towns £E 200 per acre will be paid. Rents in these Provinces will be from £E 12-£E 17 per annum. The Bank advances only half the value of the land, which is generally assessed according to the Government tax.

METHOD OF MORTGAGING.

According to the mode of procedure for mortgaging land, the fellah obtains a bank form stating the quantity of land he owns; how obtained, whether by purchase or inheritance; how much of the land is previously mortgaged; whether he himself works the land or if it is rented out; value of the land; boundaries; reasons for loan; names of heirs; and various other details. This form having been filled out in the village, is then signed by the headman and clerk of the village, who also vouches for the good character of the client. The form is then sent to the Bank where it is checked according to the Government Land Registers. If it is found to be correct, an act of mortgage is then made out, and an audience fixed for a certain date, and on that date all the clients of the district will assemble before the Government Greffier and sign their acts of mortgage, after which they receive their amounts, less cost of registration. The moment the audience is finished, the names are telegraphed to the Head Office, and at once registered in the Government Land books, or the mortgagee, might get in a second mortgage on his land, or even sell it to some unsuspecting person.

COLLECTION OF INSTALMENTS.

As regards the payment of instalments, at the expiration of two months, during which the Government tax-collectors collect the money, a list of all defaulters is sent in to the Bank, through the Government. The Bank then sends out its own collectors to endeavour to induce the defaulters to pay, and the English Inspectors are constantly visiting the villages to use their influence and to point out to the fellah the best way to arrange his payments. The English Inspectors make a point of seeing the clients individually, and seeing that justice and fair play is dealt out to the fellah. As long as everything is straightforward, the fellah keeps up his yearly payments well; on the whole, the two chief factors for his getting into arrears seem to be either the death of the original owner and consequent division of the land amongst innumerable heirs who cannot agree amongst themselves as to their share of payment, or the mortgagor selling his land to third parties who cannot agree as to payment.

DIFFICULTIES OF APPROPRIATION.

If a man gets into arrears, he may re-mortgage his land for a further period of twenty years, the remaining amount of his original loan, plus the interest on his arrears being deducted from his new loan. Otherwise, if he gets into arrears for two or three years and it is thought not desirable to accept a re-mortgage, legal proceedings are then instituted for the appropriation of the land. Owing, however, to the Bank being a European Company, all its legal work must be done through mixed tribunals, which causes endless delay: it takes as long as three years to expropriate a man of ½-acre of land. If appropriation were swifter the fellah would not be so inclined to put off the evil hour of payment.

LOANS FOR MANURE AND SEED.

In certain cases the Bank also lends small loans on note of hand only, payable in one year, these loans being chiefly for manure or seed and are nearly always paid up.

A SEVEN PER CENT. DIVIDEND.

It will be seen from the foregoing that the Agricultural Bank of Egypt is a thoroughly sound concern that has done and is doing a great work for the benefit of the fellah. But it is also a sound financial business, for though Lord Cromer looked upon it as a more or less philanthropic concern, it pays a regular 7 per cent. to its shareholders.

According to the *Journal of the Board of Agriculture* (April 1913) there were at work at the end of 1911, 223 co-operative credit associations in the United Kingdom with an aggregate membership of 22,054, as compared with 81 associations and 6,014 members in 1901. Forty five (of which 18 were urban) were situated in England, one (urban) in Scotland, and 177 associations (all rural) in Ireland.

FRUITS AND FRUIT TREES.

GRAPES WITHOUT PIPS.

The point of view followed in the investigation with which this article deals, was the possibility of devising methods for increasing the number of pipless grapes on a normal bunch, not at the expense of the grapes with pips, but from flowers which, in the ordinary way, fall without producing fruit of any kind. An alternative and more novel aspect of producing table grapes without seed—as has been done in the case of the orange and other fruits—does not receive attention in the investigation, inasmuch as its achievement would appear to be physiologically almost impossible.

The results of the work referred to, carried out mainly in Italy, are abstracted in the *Monthly Bulletin of Agricultural Intelligence and of Plant Diseases* for April 1913.

Dealing first with the causal factors entering into the production of seedless grapes, it is stated that these had been shown by previous investigations to be as follows: (1) the presence on the bunch of relatively few fertilized flowers; (2) possibly the stimulus of the growth of the pollen tube without actual fertilization; (3) presence in the stock of a high content of organic nutrients, a condition which is produced by ringing.

A repetition, in Italy, of experiments similar to those which led to the above conclusions gave the following results. The relative number of grapes with and without pips was not found to be constant, and it was noticeable that, in bunches where any of the grapes are pipless, the grapes of both kinds (with and without pips) are relatively large; the reverse is the case where the pipless grapes are few in number or completely wanting. Ringing was found to have the effect of largely increasing the number of pipless grapes, and the average weight of the grape, with or without pips, is also usually greater in the case of the ringed vines.

The formation of pipless grapes in the place of normal ones greatly diminishes the production on account of the considerable difference in weight existing between the two, which is shown by the following figures:—

2,641 pipless grapes, average weight, 0·187 gramme
3,240 grapes with pips, ,, ,, 2·130 grammes

The loss which must ensue is therefore very evident. To prevent it, every effort should be made, especially where ringing is done, to promote pollination—particularly cross-pollination—by the following means:—

(1) Grow in the same row, varieties which cross-pollinate readily; (2) in the glass house, or in garden cultivation, artificial pollination is often of great assistance; (3) flowers should be prevented from falling by repeatedly dusting them with flowers of sulphur.

The adoption of these methods should cause a maximum number of large grapes with pips to be produced per bunch, and the development of flowers which would normally fall, into moderately large pipless fruits.

It is always advantageous to have a small percentage of pipless grapes on the bunch, in spite of the fact that they do not contain much sugar.

COST OF SPRAYING CACAO IN TRINIDAD.

At a recent meeting of the Trinidad Board of Agriculture, the Mycologist (Mr. J. B. Rorer, A.B., M.A.) presented a report on the actual cost of spraying cacao derived from trials made by himself and by different planters.

It is pointed out first that the cost of spraying may be divided into three classes: (1) capital account, which includes all apparatus and machinery; (2) cost of labour used in mixing and applying the spray; (3) cost of the necessary materials.

The following figures are next given in regard to the actual cost of carrying out the operations. It is stated that a barrel outfit costing about $50 will spray under favourable conditions about 500 trees per day. A set of compressed air knapsack sprayers costing about $100 will do the same work, so if it is necessary to spray at the rate of 1,000 trees per day, from $100 to $200 must be invested in apparatus.

In regard to labour, one man should be able to spray at least seventy-five trees per day. Practically speaking, a safe figure appears to be fifteen men for the spraying of 1,000 trees per day.

The cost of the spraying mixture depends upon circumstances. Bordeaux mixture generally costs about $8 per 1,000 gallons. Bordeaux mixture with 8 lb. of arsenate of lead to the 100 gallons costs $16 per 1,000 gallons. Nicotine-sulphate solution costs about $10; kerosene emulsion is still more expensive. On an average, the spray-mixture will be applied at the rate of about ¾-gallon per tree so that 1,000 gallons of mixture will cover about 1,300 trees.

Taking the figures given above as a basis for calculation, it is inferred in the report, that thorough spraying will cost about $15 per 1,000 trees per application. This is believed to be the maximum cost. It is pointed out that if fruit alone is sprayed the cost will be reduced by one-half or two-thirds.

In conclusion Mr. Rorer states that in Trinidad an increased number of planters are each year becoming satisfied that a direct profit is to be obtained by careful spraying. The general experience seems to be that if the profitable nature of the operation can only be demonstrated conclusively, proprietors are only too glad to take it up.

THE KILN-DRYING OF GRAIN.

Owing to the great interest shown in the West Indies concerning the drying of grain, especially Indian corn, a letter was addressed recently by the Imperial Commissioner of Agriculture to the Chief of the Bureau of Plant Industry, United States Department of Agriculture, asking for information as to the process of curing or conditioning grain known as kilnd-rying. As a result, communications embodying important facts on the subject have lately been received from three firms who manufacture drying machinery employed in this connexion, and this information has been included in the following article.

The process of kiln-drying has for its principal object the removal of a certain amount of the moisture contained in grain in order that it may not suffer from fermentation, sprouting, and the development of saprophytic fungi—the latter producing mildew and mustiness while the grain is in storage or in transit between the time of reaping and its receipt by the consumer.

In northern temperate climates during former years, maize and other grains have in small quantities been cured in the field and in barns without the use of artificial means of drying, with only occasional losses resulting from the excess of moisture; but when produced in enormous quantities, as in the case of the grain farms of the United States and the British North-West, and when received and stored in the great grain elevators, it becomes necessary to resort to some means of protecting the seed from the natural consequences of the presence of large amounts of moisture.

The principle involved in the kilns or driers is based on the well-known facts that air may, by cooling, be divested of a very large proportion of its moisture, and that if this dry, cold air is heated to a high temperature, it will re-absorb a large amount of moisture very rapidly on coming into contact with damp or wet objects, which are capable of giving up their moisture.

The driers are generally installed in a building specially designed and used for the purpose. The essential parts are: (1) the machinery necessary for drying the air by cooling it, for heating it again and for forcing it through the grain; (2) the drying chamber in which the grain comes into contact with the hot, dry air; (3) the cooling chamber where the grain, heated by contact with the hot air, is cooled to a normal temperature by currents of cold, dry air; and (4) the machinery necessary for moving the grain from place to place.

The usual arrangement is to have, at the top of the building, a 'garner' which receives the material to be treated; beneath this is the drier, and beneath this, in turn, is the cooler. The grain is transferred to the garner, and from this point it passes by means of the necessary spouts, by gravity, to the heater, then to the cooler and then to the carriers by which it is transported from the kiln.

The details of the application of the hot and cold air to the grain in the drier and the cooling chamber vary in different makes of machinery. In some of these machines the grain passes in a continuous flow through the hot air into the cool, the speed of this process being regulated so that the desired result is obtained. In others, the drying chamber is charged with grain, which at the expiration of the necessary period of time, is passed on to the cooler. The drier is then again charged. These kilns range, in capacity, from a few bushels to several thousand per hour.

In addition to removing the moisture which is naturally contained in grain insufficiently cured, kiln-drying may be resorted to for the purpose of conditioning grain which has become wet by accident, and for destroying insects and fungi, thus often improving its quality and effecting a saving to growers or dealers.

Seed which has been kiln-dried may be used for planting, since experiments conducted by the officers of the Bureau of Plant Industry (see Bulletin No. 100, Part III, of that Bureau) show that the process of kiln-drying does not impair the power of germination of the grain (wheat in the trials reported) but rather increases it.

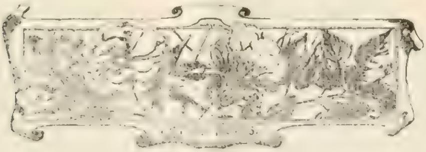
Under ordinary circumstances, air-dried grain contains an average of 14-15 per cent. of moisture: any excess over this percentage is removed by the process of drying—in fact, the moisture content is usually reduced to something below this, say, to 11 or 12 per cent., while it may be reduced to an amount as low as 8 or even 7 per cent. The greater proportion of the moisture is, of course, removed in the drier while the grain is in contact with the current of hot air, but a certain appreciable amount is got rid of in the cooler by the cold air, which, having been divested of most of its moisture, absorbs what it can as it is warmed by contact with the hot grain.

In order to effect the proper drying, the grain has to be subjected to a temperature of from 100° to 200° F. A temperature of 140° to 160° F. maintained for a short time is fatal to most, if not all, of the insects and fungi which are likely to infest grains, while, as is already stated, the power of germination of the grain is not injured by this amount of heating.

In their application to the needs of the West Indies these drying machines would probably be used for drying Indian corn so that it might be successfully stored, and for preventing insect attack on the stored grain, since any attack or infestation by grain insects could be remedied by passing the grain through the driers

The names of the firms that have provided information in this connexion are, The Hess Warming and Ventilating Co., 708 Tacoma Building, 131 La Salle Street, Chicago; The Morris Grain Drier Co., 51 Chamber of Commerce, Milwaukee, Wisconsin; and the Macdonald Engineering Co., 549-553 Monadnock Building, Chicago.

An abstract appears in the *Journal of the Chemical Society* for May 1913, describing the changes which occur in the coagulation of the latex of *Hevea brasiliensis* when this is left exposed to the air. It appears that the coagulation is brought about by an enzyme (probably a protease). Anaerobic decomposition occurs in those portions which are out of contact with air, and the presence of an oxydase is indicated, to which the name 'hevease' is applied. A fourth factor consists of changes which occur in the presence of oxygen (aerobic). These give rise to an alkaline mucus which causes the latex to become milky.



WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date June 16, with reference to the sales of West Indian Sea Island cotton:—

Since our last report the business in West Indian Sea Island has been confined to about 70 bales of Montserrat at 16*d.*, and 90 bales Jamaica at 14*d.* The consumption of Sea Island cotton of all descriptions continues very limited, in spite of the small crops in both America and the West Indies.

Spinners are quite indifferent buyers, and their requirements being small, they will only offer very low prices when any specific lots are pressed for sale

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending June 14, is as follows:—

The market has been very quiet throughout the week with apparently no demand. Factors are nominally asking previous prices but are disposed to meet the views of buyers, not wishing to carry the stock on hand into the next season. Since the close of the Exchange report, two small crop lots, 10 bales Calais and 8 bales W:H.M., were sold on private terms for export:—

Extra Fine	28c. to 29c.	= 16*d.* to 16½*d.*	c.i.f., & 5 per cent.
Fully Fine	26c. to 27c.	= 14¾*d.* to 15¼*d.*	,, ,, ,, ,,
Fine	25c.	= 14¼*d.*	,, ,, ,, ,,
Extra Fine off in preparation	22c.	= 12½*d.*	,, ,, ,, ,,
Fully Fine off in preparation	18c. to 20c.	= 10½*d.* to 11½*d.*	,, ,, ,, ,,
Fine off in preparation	18c.	= 10½*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to June 14, 1913, were 2,106 bales, 5,714 bales, and 4,675 bales, respectively.

THE WORLD'S COTTON INDUSTRY IN 1912.

An article which appears in the *Journal of the Royal Society of Arts* for May 9, 1913, provides interesting statistics in regard to the number of spindles that were active, and the amount of cotton consumed, during 1912.

The world's consumption of cotton during the year referred to has been placed at 20,587,000 bales, as compared with 19,013,000 bales in 1911. But as is pointed out, these figures do not represent the total consumption of cotton, for in many countries, for instance, India, a large amount of this commodity is consumed locally and does not pass therefore through the ordinary commercial channels. It is of interest to compare these figures with the world's production of cotton from the crop of 1911, which is stated to have amounted to 22,297,000 bales of 500 ℔. each. This includes the total production for British India.

The article goes on to say that the number of active spindles in the world has been estimated at 140,996,000. In Great Britain there were 55,000,000 active spindles in 1912, compared with 45,000,000 in 1900; while the quantity of cotton consumed increased from 3,300,000 bales in 1900 to 4,200,000 in 1912 The interesting fact is noted that the spindles operated in the United Kingdom during the past year constituted 39 per cent of all the active mill spindles in the world, but the quantity of cotton consumed by them formed only 21 per cent. of the total.

In considering this figure it must be borne in mind that it is not truly representative of the place which Great Britain holds as a cotton-manufacturing country, since the greater part of manufactures are of much finer quality than those produced elsewhere. Only about 20 per cent of the total quantity of cotton goods manufactured is consumed in the country, the remainder being exported, chiefly to India, China, Turkey, Egypt. Australia, Dutch East Indies, Argentina, and the United States.

As regards the development of the cotton manufacturing industry in different countries, the most interesting case appears to be that of Italy, where the number of active spindles increased from 1,940,000 in 1900 to 4,580,000 in 1912. It is interesting to note that great progress has been made in connexion with cotton manufacturing in British India, which occupied the fourth position in importance during the year 1912. The manufacture of cotton is also developing in many of the South American countries.

RAPIDITY OF GERMINATION IN TOBACCO SEED.

The following summary of results of an investigation into the influence of sulphuric acid, and of factors like age and hybridization on the germination of tobacco seed, appear in Vol. V, No. 5 of the University of California Publications in Botany:—

(1) The action of 80 per cent. sulphuric acid upon tobacco seed for lengths of time not over ten to twelve minutes increases markedly the total amount of germination, and in certain cases increases rapidity of germination.

(2) The action of concentrated sulphuric acid (sp. gr. 1·84) for periods of time as short as one minute killed the seed used.

(3) A markedly injurious effect of prolonged washing with running water after sulphuric acid treatment was noted.

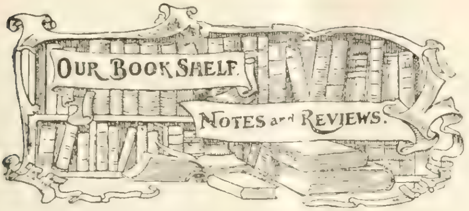
(4) Six, seven, and eight-year-old tobacco seed was found to give a relatively high percentage of total germination in most cases.

(5) Rapidity of germination in general was found to be independent of the age of the seed, and to be characteristic of the seed of certain species or varieties throughout, and not characteristic of others.

(6) A certain period of 'after ripening' seemed to be essential for average germination percentages as shown in the case of 1912 *N. acuminata* varieties. Seed taken from dehiscing capsules on the plants in the field gave very low percentages of germination in the case of *N. acuminata* varieties alone.

(7) F1 hybrid seed, three years old, gave higher percentages of germination than the seed of the parents of the corresponding cross and of the same age.

(8) The relation between the germination of parent and hybrid seed indicated that interesting and possibly important supplementary results could be obtained by the germination under controlled conditions of the seed used in hybridization experiments.


OUR BOOK SHELF.
NOTES and REVIEWS.

THE CANE SUGAR FACTORY: By F. J. Scard, F.I.C. *The West India Committee*, London 1913.

To those holding junior positions in connexion with sugar-cane factories, this handy volume will prove extremely useful. The subject-matter is arranged concisely in the form of question and answer in a similar manner to that adopted in the *Catechism of Agricultural Chemistry*, by Professor Johnston, and in the *A B C of Cotton Cultivation* of the Pamphlet Series of the Imperial Department of Agriculture for the West Indies. As with all works of this type, the use of the book must be accompanied by a practical acquaintance with the various points dealt with: it is not a book to be studied systematically, but to be referred to in times of difficulty, and at times when the young overseer or engineer or chemist is not fully conversant with the objects and principles of any particular operation of which he is in charge.

In the first section of the catechism, which concerns the subject of milling, the questions and answers connected with maceration should prove particularly helpful. The second section, on clarification, explains the operations of liming and the uses of sulphurous, phosphoric and carbonic acids. The succeeding subject is filtration, followed by some thirty questions and answers on concentration, which explain the causes of common difficulties encountered in the management of the multiple effect. In view of the importance of the subject, a large amount of attention is given next to crystallization, and after dealing with the subject of centrifugalling, the author proceeds to question on matters of steam supply, mainly in regard to boilers, heat units, draught and the burning of megass generally. The questions are live and to the point, as for example:—

'Q. A large extra fuel consumption is being incurred in a factory with apparently no reason for it in the machinery department. What should be done?

'A. (a) See what is the amount of fibre in the cane If percentage much below 12 per cent. an explanation is given.(b) Have the flue gases examined by the chemist, if not done in the regular routine. If these show bad combustion, cause either faulty furnace or wrong supply of air. (c) Examine megass analyses. If these show more than 48 per cent. water, a cause may be here. (d) If these are satisfactory, have the percentage of ash determined in the megass. The presence of an undue amount may account for bad results. (e) If necessary, determine by experiment the water evaporated per lb. megass. If this is below 1·8 lb. per lb. megass, condition of furnace unsatisfactory.'

The main portion of the work just reviewed concludes with a few general references to scientific control, and some ten pages of questions on distilling rum. Most of the latter are, of course, purely of a chemical nature.

Some useful tables are appended to the main body of the work, together with a lengthy glossary of technical terms, which will be found invaluable for purposes of reference, combining, as it does, technicalities of both chemistry and engineering.

In closing this book of questions it may not, perhaps, be out of place to ask an additional one—How much applied chemistry and engineering ought managers and overseers to be acquainted with? The answer to it is,—at least the information in this book.

A FORTHCOMING PUBLICATION ON THE BANANA.

The origin of this book, which is being published by the author (William Fawcett, B.Sc., F.L.S., late Director of Public Gardens and Plantations, Jamaica) was a paper on the cultivation of the banana read at a West Indian Agricultural Conference at Barbados under the presidency of Sir Daniel Morris. The paper was first printed in the *West Indian Bulletin*, and afterwards in the *Bulletin of the Botanical Department*, Jamaica.

At the request of the Secretary of the West India Committee, due to a further demand, the paper was brought up to date and republished last year in the *West India Committee Circular* with very considerable additions and several illustrations. A wish has been expressed in certain quarters by those interested in the cultivation of bananas that these articles should be put into book form so as to be convenient for reference. The opportunity was taken to increase very largely the information already given, re-write much of it, and add several chapters on fertilizers, the banana as a nurse plant and catch crop, diseases and pests, the fibre of species of banana such as Manila hemp, the making of alcohol from bananas for industrial purposes, and other matters. A review is also included of all the species of banana, whether wild or cultivated, and notes are added of botanical and horticultural interest.

The consumption of bananas is increasing rapidly year by year, and consequently more land is continually being put under cultivation in every part of the world. Much use, besides, is being made of the banana plant as a nurse plant and a catch crop. When the culture is on a commercial scale, it is necessary for planters to enter upon it in a scientific as well as in a practical manner, just as they do in dealing with rubber, sugar, or cacao. This book is intended to assist such planters in many ways, and also to be a guide to those who are taking up the culture for the first time. It is hoped that it may also prove interesting to the general reader, as it deals with the life-history of the plant, its cultivation in various parts of the Tropics, the immense value of the banana as a food both as fresh fruit and also dried as banana figs or made into flour. Another matter of general interest dealt with is the history of the development of the fruit trade both in the United States, where it has assumed enormous proportions, and in Europe where it is still in its initial stage.

Some correspondence has passed between the Colonial Office and the British Cotton Growing Association with reference to cables received by the former from the Chairman of the Dominion Royal Commission, relative to cotton-growing in Australia. The Commission are of opinion that the question of cotton-growing in Australia is worthy of closer inquiry, and the Commonwealth of Australia offer to contribute £500 towards the expense of an expert to be sent out by the Association for the purpose of reporting on the possibilities of growing high-grade cotton in Australia. The consideration of this question has been deferred, pending receipt of particulars which, it is understood, are coming forward by mail.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents and not to the Department.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the subject of Indian corn as a crop in the West Indies. It is advocated that the area under this crop could be advantageously extended. One of the chief difficulties in doing so would be overcome by the introduction of a system of kiln-drying.

On page 213 the process of kiln-drying of grain is described in considerable detail.

Under the caption Book Shelf, a new work on the cane sugar factory is reviewed, and a notice appears also, concerning a forthcoming publication on the banana.

Other phases of the University question are commented on, in the opposite column. The influence of British Universities in the West Indies is dealt with on the next page.

Insect Notes, on page 218, comprise an article on the biting stable fly, which transmits infantile paralysis.

On page 219 appear two articles entitled, respectively, A New Disease of Horses in Panama, and Interpretation of Milk Records.

Fungus Notes, which will be found on page 222, describe a recent investigation into the causes of the spotting of plantation Para rubber.

Publications of the Imperial Department of Agriculture.

During the past month the Reports on the Botanic Stations at St. Kitts-Nevis, Montserrat and Tortola (Virgin Islands) for 1911-12 have been issued. These publications, which contain an account of general agricultural progress, of the results of investigations with different crops and other matters of agricultural interest, may now be obtained from the Agents of this Department.

A new and revised edition (1913) of the booklet, 'The West Indies in Canada' will be issued shortly in time for the Canadian National Exhibition to be held at Toronto in August next. The great increase in the number of advertisements sent in this year for publication would appear to indicate in a very concrete manner, the increasing usefulness of the booklet in helping to bring together Canadian and West Indian interests.

Two new pamphlets (Nos. 72 and 73) on Lime Cultivation in the West Indies, and on Root Borers and other Grubs in West Indian Soils, respectively, are also passing through the press, together with the *West Indian Bulletin*, Vol. XIII, No. 3.

The University Question: Other Phases.

Although the discussion as to the ideal site for the proposed Agricultural University, or University College, has mainly restricted its considerations to the islands of Trinidad and Ceylon, several claims have been advanced in regard to the suitability of continental areas. The Demerara *Daily Chronicle* (June 6, 1913), whilst admitting the advantages offered by Trinidad, thinks, nevertheless, that British Guiana has quite as good, if not better claims. East Africa, too—according to a letter in *Nature* (April 24, 1913)—can offer such a rare collection of favourable factors as to justify the immediate establishment of the institution there.

As already intimated in this journal, the chief essential conditions for the establishment are: local diversity of agriculture within a small radius; accessibility to and rapid communication with the United Kingdom; healthy climate; a progressive local population. The matter of raising the requisite funds would seem to depend entirely upon what communities are going to reap the most benefit, which in its turn, rests on the nature and sphere of influence of the institution in question.

From the views that have been expressed it would appear to be becoming evident that more than one agricultural college (but each of University standing) is required, situated in those tropical countries which can best offer the essential conditions noted above. Maximum Imperial benefit might not accrue from one self-contained institution. In short, there is strong opinion current—though so far not definitely expressed—for an extension of Cambridge or London or of any well-established University to those parts of the Tropics where each outgrowth might thrive naturally and become fruitful.

British Universities and the West Indies.

In connexion with the subject just discussed, it may be of interest to consider briefly such lines of action as have already been taken by British Universities to further educational conditions in the West Indies.

Previous to 1902, the Local Examinations Syndicate of the University of Cambridge continued to publish a syllabus for Agricultural Science and for Botany adapted to meet the circumstances obtaining only in temperate countries. During the above year, however, chiefly on the strength of modifications suggested by the Imperial Department of Agriculture, a change was made, as is intimated in the following extract from a letter received from the Secretary: 'The modifications in our schedule for Agricultural Science (Seniors) suggested for centres in the West Indies, have now been adopted by the Syndicate; and I have to thank the Imperial Department of Agriculture for the assistance which they have given us in this matter.' (See *Agricultural News*, Vol. I, pp. 27, 91 and 187.)

Further evidence of the appreciation, on the part of British Universities, of the growing requirements of the Tropics is afforded by the decision some years ago of the University of London to extend its examinations to the Colonies. Another case was the affiliation of Codrington College, Barbados, to the University of Durham, and still another, the institution of special examinations conducted at Queen's College, Demerara, Harrison College, Barbados, and other schools by the University of Cambridge.

Facts like these show that a move has already been made by British Universities for some years: it is an acceleration of this movement, towards higher agricultural education, that is the crying need.

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Notes on West Indian Oils.

A great deal of useful information is contained in the Semi-Annual Report for April 1913 on Essential Oils published by Messrs. Schimmel & Co., of Miltitz near Leipzig.

The first point of interest is the reference to the recent isolation of banana oil, constituting the odoriferous principle of that fruit. It is stated that during the course of this investigation amylacetate was proved to occur in ripe bananas.

The next oil referred to is bay oil, and a long abstract is given concerning the bay oil and bay rum industry in the West Indies. It is said that the qualities of the West India oil are still inferior to those of oil distilled from leaves by perfume manufacturers in Germany and elsewhere. A short note appears next in regard to the essential oil of cacao, which was formerly considered to be identical, or associated with cacao-red. This assumption, however, appears to be quite erroneous, for cacao-red is an entirely odourless body.

Numerous West Indian lemon grass oils have recently been examined, and these, also are reported on in the publication under consideration. An interesting point noted is that West Indian oils which had originally contained from 78 to 80 per cent. of citral, showed after some years' keeping, a drop of from 4 to 5 per cent.

Some months ago an enquiry was made at the Head Office of the Imperial Department of Agriculture concerning the supplies of West Indian sandalwood for distilling purposes. In this connexion it is of interest to note that the trade in West Indian sandalwood oil has profited from the advance in East Indian oil, to the extent that sales have been brisker because the West Indian oil plays a considerable part in the cheapening of the East Indian article. Messrs. Schimmel & Co. state that they have lately again made contracts for large parcels of the West Indian article.

The last note of interest in this useful report is one on vanillin. It is stated that the raw material has recently become dearer and that few manufacturers derive any particular satisfaction from trading in this article. An interesting discovery bearing on the subject of vanillin, is the detection of the presence of this oil in the flowers of *Gymnadenia albida*, Rich. (N. O. *Orchidaceae*). The flowers have a pronounced odour of vanilla, which was extracted from an ointment-like substance of most exquisite aroma left behind after the flowers had been treated with alcohol and ether, and the solution dried after precipitating it with sugar of lead.

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Varieties of Soy Beans in Bengal.

The general conclusions reached by Messrs. Woodhouse and Taylor, in India on the commercial possibilities of Bengal varieties of soy beans appear at the end of Vol. V, No. 3, of the *Memoirs of the Department of Agriculture in India*. It is stated that the objection raised against the cultivation of this crop in the plains of Bengal are by no means unsurmountable. The price of soy bean meal is increasing and the use of soy beans for food could be extended if the educated classes appreciated its value as an addition to a rice diet.

As a field crop, in the plains, it can suitably replace Urd (*Phaseolus mungo*) as a mixed crop with maize, in which case the maize must be harvested in September and the soy beans in December. It could also take the place of the Kulphi (*Dolichos biflora*).

It appears that soy beans find more suitable conditions for growth, in India, in the hills, than in the plains, and it is expected that success in acclimatizing soy beans will not extend, at present, far beyond the foot of the Himalayas. In the West Indies the soy bean has not proved a success, and would not appear to be able to thrive vigorously under strictly tropical conditions.

The question of variety, however, is an important one, and the fact that the Bengal strains take some 200 days to mature, as compared with 150 days in the case of American varieties, would appear to make thei trial in the West Indies at least interesting

INSECT NOTES.

THE BITING STABLE FLY.

For several years past an active campaign has been carried on against the common house fly (*Musca domestica*).

This has been the outcome of repeated statements in publications of all kinds, with regard to the known habits of the insect, and its association with the distribution of typhoid fever.

More recently the biting stable fly (*Stomoxys calcitrans*) has been the object of much attention. The cause for this has been the circumstance that investigations have shown that this insect is capable of transmitting infantile paralysis, and may possibly be concerned with the transmission of other diseases of man and animals.

Interesting articles have recently appeared in the *Journal of Economic Entomology* on the biting stable fly and the transmission of infantile paralysis, to which the following references are given:—

The Relation of the Stable Fly (*Stomoxys calcitrans*) to the Transmission of Infantile Paralysis, by C. T. Brues, *Journ. Econ. Entom*, Vol. VI, Part 1, p. 101.

The Stable Fly (*Stomoxys calcitrans*, L.)—an Important Live Stock Pest; by F. C. Bishop, *Ibid*., p. 112.

These sources have been freely consulted in the preparation of the following article

The biting stable fly is similar in appearance to the house fly to which, in fact, it is closely related, both species belonging to the family Muscidae, to which also belong the African tsetse flies that convey sleeping sickness in man from infected to healthy individuals.

The biting stable fly is an insect of European origin which is now widely distributed throughout the world. It is about the same size as the house fly and very similar in general appearance to that insect. It is distinguished from the house fly very easily, by the painful bite which it inflicts on man, and on many domestic animals—horses, cattle, sheep and swine

The breeding places of the stable fly are to be found in wet and rotten straw such as that of oats, barley, rye, rice, and wheat, and also in piles of old hay and weeds. Manure of horses and cattle when mixed with a large amount of straw and litter also furnish breeding places for this insect.

During 1912, a very severe attack of this pest occurred in certain grain-growing districts in the Southern United States. At the time referred to, the flies were so abundant as to be the cause of serious loss from the injuries inflicted on domestic animals and, in addition, their attacks on the animals, when not fatal, prevented the ordinary farm work from being carried out in the usual manner. Through the persistent attacks of the flies, through the painful bites inflicted, and through loss of blood which naturally accompanied the feeding of enormous numbers of the flies—often as many as a thousand of these insects were feeding on one animal at the same time—the animals suffered greatly from torment and worry. Many animals died; milch cattle fell off in milk flow; fat animals became thin and poor. It was found, too, that many cattle after experiencing severe attacks of the stable fly, developed Texas fever. This was not due to any infection by this insect, but rather to the fact that the cattle, when in good condition, did not show any effect of the presence of the pyroplasma, already in the blood, which causes Texas fever; but when weakened by irritation and loss of blood, the animals succumbed to the organisms which rapidly developed under the favourable conditions produced for them by the flies.

'The recent attention which has been given to the rôle played by insects in the transmission of disease, has led many investigators to consider the possibility of Stomoxys acting as vector of a number of diseases of live stock and man. The work of several investigators indicates that the stable fly takes a more or less important part in the transmission of surrah of domestic animals, a trypanosomiasis in cattle in Portugese East Africa, souma (*Trypanosoma cazalboui*) of the ox, horse and sheep, *T pecaudia* of hogs, cats, etc., and anthrax in domestic animals and man. Other workers believe that the fly may, in some cases, be connected with the transmission of septicæmia in man, glanders in horses and other animals and certain other maladies. In this country [U. S. A.] the recent work of Brues and Sheppard on the apparent etiological relation between Stomoxys and poliomyelitis [infantile paralysis] and the work of Jennings and King pointing toward the connexion of the stable fly with pellagra transmission, has had the effect of greatly stimulating the interest of entomologists as well as medical men in the study of this insect, and its possible relation to the transmission of various diseases, the etiology of which has not been fully elucidated. As is now generally known, the conclusions of Brues and Sheppard have been greatly strengthened by the work of Rosenau, which demonstrated that the stable fly can transmit poliomyelitis in monkeys. The results of Rosenau have been corroborated by experiments along the same line conducted by Anderson and Frost of the United States Public Health Service.'

There appear to be no records of serious outbreaks of the biting stable fly in the West Indies, and, in fact, this insect is definitely recorded only in Jamaica and St. Vincent, in these islands

The circumstances that the insect is known to occur in such numbers as to be a serious pest of live stock, and that it is able to transmit infantile paralysis (poliomyelitis) in man, would indicate that its presence ought to be recorded wherever it occurs: in addition to this, it is of importance in connexion with the disease known as pellagra, which occurs in the West Indies, and which, at the present time, is but little understood. The sand flies of the genus Simulium have also been suspected of being carriers of this disease, and they, too, are either generally absent from these islands, or are at least not recorded.

West Indian readers of the *Agricultural News* are invited to collect and forward specimens of any biting flies which they may observe, together with any notes. Specimens may be forwarded through the Agricultural Officers in each island.

At a meeting of the Barbados Agricultural Society on June 27, 1913, a discussion arose as to the best way of reducing the numbers of the brown hard back (*Phyfalus smithi*), which appears to be causing considerable damage to sugar cane in Barbados. It was stated that the brown hard back, during the earlier period of the year, is usually found under old cane stumps. One member thought that a good way of getting rid of this serious pest would be to offer a prize of $5 to the boy who produced the largest collection of them at the Agricultural and Industrial Exhibition held in December every year. Mr. J. R Bovell, I.S.O, F.L.S., Superintendent of Agriculture, addressed the Society on the subject of parasites. The one referred to of the greatest importance was the small black wasp, *Tiphia parallela*. (See *Agricultural News*, Vol. XII, p. 186.)

VETERINARY NOTES.

A NEW DISEASE OF HORSES IN PANAMÁ.

A recent publication issued by the Panama Canal Zone Medical Association (Vol. III, Part 2, 1911) describes a disease called Murrina, induced by a parasite identified as *Trypanosoma hippicum*, nv. sp.

The disease first showed itself in the form of an epidemic amongst American mules and work horses in Panama. The disease resembled other trypanosomal diseases such as Nagana, Surrah, Mal de Caderas and Senegambian horse disease; but it presented a group of symptoms and pathological features which made it likely that it was distinct from these. It is entirely a disease of mules and horses, for cattle are not susceptible. The agent, *T. hippicum*, referred to above, possesses morphological and biological characters which differ from other species of trypanosomes. These specific differences may be seen by referring to the bulletin under consideration.

The clinical features or symptoms of the disease are described in the publication as follows: 'general weakness and droopiness, followed by progressive emaciation, the coat becoming rough and staring. At first there are febrile paroxysms, and later an irregular or continued fever, reaching 104° or 106° F., rarely 107° or 108° F. A severe anaemia develops, with pallor or a muddy colour, and ecchymosis of the nasal and ocular conjunctivæ. Toward the end of the disease in some animals a staggering gait was noticed. Extreme emaciation, edema of sheath, lower abdominal walls or legs, were features observed in some animals permitted to die of the disease'

The disease is probably transmitted mechanically by flies through the broken skins of cuts and various wounds. Saddle horses were not infected and there was no evidence that any animals were infected by means of stomoxys (stable flies) or tabanids (bot flies), or by ticks or bats. The epidemic, which threatened to destroy several hundred mules and horses, has been controlled by isolating animals that have been found to have been infected. The presence of the disease was detected by means of daily routine temperature records, and the microscopical examination of the blood of all those animals which were found to have a temperature above 100° F. All infected animals were killed, whilst suspects were isolated in screened stables.

INTERPRETATION OF MILK RECORDS.

The practice of keeping milk records is almost nonexistent in the West Indies, but in England, and in all countries where dairying constitutes an important industry, the use of this form of statistic is becoming more and more recognized.

The value of knowing what weight of milk a cow is yielding lies in several directions: it supplies irrefutable evidence to show the extent to which one animal is better than another; it provides a basis for selection in breeding; and it serves to indicate the influence of changes of food and environment on the animal's normal physiological, somatic capacity for giving milk.

Hitherto breeders have generally relied upon such figures as total yield per calf, yield per calendar year, average per week, etc., but the enormous fluctuations exhibited in the same animal show these to be subject to a variety of outside influences.

Quite recently the results of an important investigation have been published in the *Journal of the Royal Agricultural Society of England*, Vol. 73, of which the object has been to find a method of obtaining from ordinary records, a single unqualified figure which will accurately describe the milking capacity of any cow.

The descriptive figure devised in the investigation under consideration is called the 'revised maximum', and consists in the maximum day-yield three times reached or exceeded.

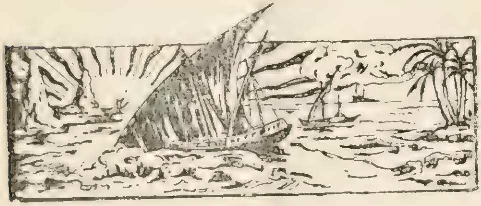
This figure bears a close relationship to the total yield of a normal lactation, and shows rather less variation than that total. It is outside two of the most active external influences, namely length of lactation and time of service, and it is suggested that general environment has a minimum effect on it. Further, a cow can usually be judged within a few weeks of calving, since normal lactation totals can be estimated from the 'revised maximum' with considerable accuracy.

It is not necessary to enter here into the mathematical methods employed in the investigation that brought out this important result It may be noted, however, that the research was only rendered possible, in the first instance, through the existence of many years' reliable records,—which in itself should provide sufficient stimulus for an extension of the practice, even to the West Indies.

Friesland Cattle.—In the more settled portions of South Africa, those who rear live stock appear to be no longer content to derive profits entirely from breeding animals for the production of beef, but look to provide, further, a regular monthly income from milk, or milk products, in some form or another.

A note on this question has recently appeared in the *Rhodesia Agricultural Journal*, where attention is directed to the difficulty of quickly breeding from native stock, milch cows of a sufficiently high standard for the purpose of developing the dairying side of cattle breeding. In 1909 it was decided in a certain quarter, to import Friesland cattle from Cape Colony. A good deal of anxiety existed in view of the susceptibility of these animals to several diseases that are common in Rhodesia, but the health of the animals was successfully maintained during the first year by spraying them, to keep down ticks. Eventually the animals became gradually innocuous to tick-borne diseases, and the experiment is to be regarded as having proved successful.

With reference to the above article on a new disease of horses in Panama, a reprint from the *Journal of Experimental Medicine*, Vol. XVII, No. 5, states that it has not been possible to cure the disease by means of arsenic as has been done in the case of surrah disease. The disease in question, trypanosomiasis, is believed to occupy a position between malaria and syphilis, with regard to the amount of actively acquired immunity derived from infection. Experiments were carried out with a view of showing that immunization of large animals can be effected by means of a weakened strain of the pathogenic trypanosome which causes the disease (*Trypanosoma hippicum*), that immunized animals completely recover from the infection, and that they cannot be reinfected by the same strain nor by a virulent strain of the same species. It is believed that a practicable mode of immunization of large animals to forms of trypanosomiasis can be developed. In one experiment a mule which had been vaccinated in this way was later reinoculated with a virulent strain of the organisms recently obtained from a fatal case of the disease in a Panaman pony; but there were no symptoms, rising temperature, haemagglutination, nor trypanosomes.



GLEANINGS.

Information concerning the forwarding of exhibits for the forthcoming exhibition to be held in Canada appears in the St. Kitts *Daily Express* (June 20, 1913).

The Antigua *Sun* (June 14, 1913) asks why the lime industry cannot be taken up in some parts of that island. Reference should be made to the Report on the Botanic Station, 1911-12.

During the month of May, in St. Lucia, it is stated by the Agricultural Superintendent that green limes were shipped to Dominica and America. The lime factory building has been started and the plant ordered.

The Curator of the Experiment Station, Tortola, states that cotton stainers in that island have been prevalent during May, but as the crop was practically over they had not done serious damage.

In St. Vincent a scheme has been propounded by the Agricultural Superintendent, for a cotton-growing competition, for small holders. Meetings have been held, with an average attendance of over sixty, and keen interest has been displayed.

The *Monthly Bulletin of Agricultural Intelligence and of Plant Diseases* for April 1913, contains an interesting article summarizing recent papers by Messrs. J. R. Bovell, W. Robson, W. N. Sands and H. A. Tempany on subjects concerning the cotton industry in the West Indies

The planting of cotton was practically completed on estates in Montserrat by the end of May; small growers, however, are now only preparing lands for planting. Cotton fields generally are showing regular stands, and few complaints have been received concerning bad seed.

At the beginning of May, auction sales in London led to a rivival in bidding for certain Ceylon biscuits. A lot of 5 cases secured the top price of 3*s*. 5¾*d*. per lb., whereas at the same sale f.a.q. crêpe realized 3*s*. 2¾*d*., and sheet 3*s*. 3¾*d*. per lb. The *Rubber World* says this indicates a shortage in biscuits.

Information is presented in the Grenada *Government Gazette* (June 2, 1913) to the effect that a rapid development of the lime industry has taken place in Carriacou. It is stated that the Carriacou lime juice has already attained premier rank in the northern markets. Encouragement is also being given in this island to the development of the coco nut industry.

It appears that under normal conditions, yeast and bacteria do not influence the time of fermentation of tea. If during the various stages of the process a pure culture of yeast is added, the finished product is not appreciably improved. Bacteria when added in large amounts destroy both the tea leaves and the yeast. (From the *Experiment Station Record*, Vol. XXVIII, No. 6.)

An Ordinance to make provision for the protection of certain wild birds has recently been passed by the Government of Antigua. The birds to be protected (Schedule A) are: humming birds, yellow breast, West Indian canaries, banana bird, pea whittler, blacksmith, West India robin, chitty birds, gauldings, Barbados blackbird, loggerhead, coo-coo, tern, crane, kingfisher, sour sop bird, and blackwitch.

An article appears in the *Dominica Guardian* (June 20, 1913) on the subject of the green lime trade in that island. Reference is made to the recent fall in prices, and it is believed that matters are not improved in this respect by the tendency amongst small growers to pick limes early in an immature condition. It is stated that limes are occasionally sent from Dominica, of an extremely inferior grade.

The *Cuba Review* says that grape fruit from Jamaica is regularly on sale in Austria, is popular, and retails at from 20 to 25c. each. In England, people have bought the grape fruit at from 12 to 16c. each, thinking it is a large orange. They try to eat it as if it were an orange, find it tart, and are disappointed. This appears to show the necessity of agricultural education to the consumer as well as to the producer.

At the general assembly of the International Institute of Agriculture in session at Rome, the proposal was advanced that a Government Service of Phytopathology (plant diseases) should be established by all governments adhering to the above Institute. The growing necessity for international co-operation in regard to plant diseases has been rendered evident from time to time under Fungus Notes in the *Agricultural News*.

Under the heading 'Agricultural Notes' in the Demerara *Daily Argosy* (June 21, 1913), it is stated that temperatures have been too low during the past few days, and heavier showers, with good intervals of sunshine and heat are required to encourage vigorous growth. The young cultivation, however, is growing vigorously. Tillage is being pushed and weeders are being employed in keeping down grass, which has, of late, grown rapidly. The sugar market remains very dull, and that for rice is described as lifeless.

A note in the St. Vincent *Sentry* (June 13, 1913) refers to the recent gift to the chief planters in that island by the Association of Fine Spinners in Lancashire, of some very fine cotton fabrics made of St. Vincent cotton. The articles in question are said to bear testimony to the excellent quality of the lint from which they were made, and, as was hinted in a recent editorial in the *Agricultural News*, it would be a good thing if salesmen of cotton manufactures would in the ordinary way guarantee the genuineness of articles made from superfine lint like that of St. Vincent.

STUDENTS' CORNER.

JULY.

FIRST PERIOD.

Seasonal Notes.

In planting budded stock in wet districts a circle 4 feet in diameter should be forked and the soil mounded. The plant is placed near the centre, the lateral roots are spread out and the soil pressed down firmly. If this practice be followed, no water can lie around the collar of the plant during the wettest weather. (Compare these notes with the article on Rubber Planting on Hillsides, in this or the succeeding issue of the *Agricultural News.*)

In a month or two the planting of cacao will be proceeded with. In some places this crop is planted only under shade. Are tannias and bananas of any use in this respect?

At the present time considerable attention is being given to curing and packing. What temperatures occur during the fermentation of cacao, and what changes accompany these increases? (See *Agricultural News*, Vol. XII, p. 91.)

It has lately been shown that the aromatic principle of cacao is an essential oil and not, as was formerly supposed, a property of cacao-red. Is this fact of any commercial significance?

A watch should be kept for 'canker' of cacao, and it should be borne in mind that at this season, wood ants are liable to cause some harm. How is white arsenic employed as a remedy for these attacks?

The grafting of selected varieties of cacao may be proceeded with during this quarter.

A note was inserted in this column in the last issue of the *Agricultural News* on the subject of exhibitions. In continuation, the accompanying illustrations of labels for exhibits are given. These labels have been employed with much satisfaction in Antigua at the local shows. Further reference to this subject will be found below.

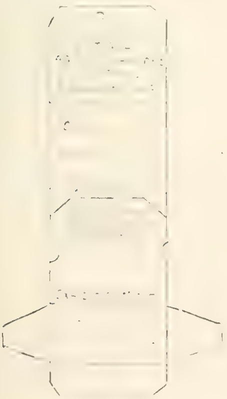


FIG. 9.

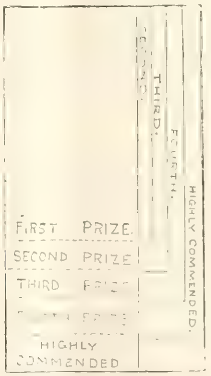


FIG. 10.

EXHIBITION LABELS.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What reasons are there for the statement that plants grow better in tins than in ordinary earthenware pots? How would you allow for drainage in the case of the tin can?

(2) Explain how a shoot develops from a sugar-cane cutting.

INTERMEDIATE QUESTIONS.

(1) Give a short account of half a dozen canes that showed promise in the Leeward Islands Experiments, 1911-12.

(2) Mention six useful trees in the West Indies that are notably resistant to drought. Say how you would identify them, and add notes on their economic value.

FINAL QUESTIONS.

(1) Calculate from the Market Reports, on page 224 of this issue, the average current market value of 1 lb. of the following commodities: (a) sugar—centrifugals 96°, and muscovados 89°, (b) cacao, (c) arrowroot, (d) coffee, (e) rice. How do these figures compare with the relative costs of production?

(2) Write a short essay on the benefits that would accrue from the establishment of a tropical agricultural university.

Work of Agricultural Pupils in Dominica.—The following gives an idea of the useful nature of the instruction given to pupils at the Botanic Gardens, Dominica:—

'Practical knowledge of methods of plant propagation, nursery work, planting and care of staple crops such as limes, oranges, cacao, rubber, vanilla, fruit, and the commonly cultivated provision crops. The course includes instruction work in the various forms of tillage, drainage, weeding, sowing, transplanting, use and application of manures and mulches; the treatment of insect and fungoid pests, pruning, grafting, packing, transporting and planting out young plants; picking, preparing and packing crops for market.'

The notice in the Dominica *Chronicle* from which the above has been taken, announces that during July there will be three vacancies for pupils. As is well known, under the present system a small allowance is granted to pupils whose conduct and progress are satisfactory.

Labels for Agricultural Shows.—In the opposite column of this page, some diagrammatic representations are given of labels recently used at the Antigua Agricultural Show. The chief feature of the label shown in Fig. 9, is that the exhibitor's name is covered up by gumming the bottom lip or projection underneath the word 'award'. After judging has taken place this can be conveniently torn open along a perforation line provided along the top edge of the lip. The cost of these safety labels is 14*s.* 3*d.* per 1,000, in England.

Fig. 10 is supposed to show the nature of a special prize slip block. The layers—first prize down to highly commended—overlie each other and are printed in different colours.

Both Fig. 9 and Fig. 10 are reproduced to scale, being one-third the actual size.

FUNGUS NOTES.

THE SPOTTING OF PLANTATION PARA RUBBER.

In a recently issued Bulletin (No. 16) of the Department of Agriculture, Federated Malay States, C. K. Bancroft, the late Mycologist to that Department, describes the results of investigations conducted by him, with a view to ascertaining the exact cause, and the possibility of controlling the spotting of plantation Para rubber. Previous explanations of the causes are noted first in the introduction, where reference is made to the observations of Petch in Ceylon, and Brooks in the Straits Settlements, the latter investigator having isolated from spotted areas a species of bacteria—an organism which the present author was later able to confirm as being one of the several causes of the discoloration in question.

APPEARANCE OF THE SPOTS.

Proceeding to describe the appearance of the spots on Malaya rubber, it is noted that the colours observed were bright-red, pink, reddish-yellow, dark-blue, bluish-green and bright-yellow, while black and clear spots have been recorded. The colours are usually more clearly visible if the spotted rubber be held up to the light. The spots were found to vary in size from small specks of about 1 or 2 mm. in diameter to large blotches as much as 15 cm. in width. Collected evidence showed that the production of the spotting appeared to be of an epidemic nature, and in some cases the production was limited to one or two fields on a single estate. Certain forms of prepared rubber (e.g. thick crêpe) were found to be more susceptible to spotting than others, while some forms have never shown spotting (e.g. smoked sheet).

CAUSE OF SPOTTING.

Owing to its opacity, the discoloured rubber could not be easily examined microscopically. Portions, however, were removed aseptically and placed in sterile cane juice agar and in nutrient bouillon + 10. Sometimes a growth of a single organism resulted; in other cases common moulds of the Eurotium and Penicellium type appeared besides. It was found after several trials that to obtain a growth of hyphae from the caoutchouc, fresh material had to be used.

The first fungus isolated, which produced a red discoloration, was identified provisionally as *Monascus heterosporus*, Schroter—an organism that has been found on the refuse of candle manufacture in Bavaria. In cane juice this fungus produced a red pigment usually within five days, but it was found that continued cultivation in cane juice resulted in a loss of pigment production.

To make certain that this fungus could cause red discoloration in rubber, some biscuits were inoculated with it. In some cases the development of a red colour was produced From these experimentally discoloured areas the same fungus was re-isolated.

The next fungus obtained was *Spondylocladium atrovirens*, nv. sp., from yellowish-red spots on crêpe rubber. No inoculation experiments were carried out as in the previous instance. Following this, a Mycogone-form was obtained from a pink flush that appeared in two sheets of rubber. The colour of the fungus in culture was deep red. Finally, of the fungi obtained in these experiments, was a Diplodia-form (*Thyridaria tarda*), which the author had previously shown to cause a dying back of the stem of the Para rubber tree. This fungus causes a dark-blue spotting on crêpe rubber.

Perhaps one of the most important causes of red discoloration in rubber is the presence of an organism which was regarded as being *Bacillus prodigiosus*, a species of bacteria which, as is well known, produces a reddening in bread, meat and other articles of diet. Inoculation experiments with this organism were successful.

Among other organisms suspected of causing discoloration were a species of Sterigmato cystis, a red yeast, other bacteria besides *B. prodigiosus*, e.g. Sarcinae, and species of Penicellium and Aspergillus, the latter two being regarded as the cause of clear patches on sheet rubber.

SOURCES OF INFECTION.

The Diplodia-form isolated is of very common occurrence on recently dead vegetable matter of all kinds, and it is not difficult to conceive that this fungus can easily gain entrance to the latex, either before or after coagulation. An important result in connexion with the sources of infection is contained in the following quotation: 'Poles of uncured jungle wood have been sometimes employed in drying houses for hanging rubber, and these have been found to bear superficial growths of fungus mycelia. By paring off thin strips of the poles, and introducing them into nutrient media, growths of three of the above fungi have been obtained, viz: *Monascus heterosporus*, *Spondylocladium maculans* and the Diplodia form. . . . . . . The above observations offer a possible explanation of a phenomenon whose nature was for some time quite obscure, viz: the distribution of the spotting on crêpe rubber in transverse bands recurring at intervals. It was not possible to suggest any explanation of this regular distribution of colour until the fungi had been isolated from the racks on which the crêpe was hung. On two occasions *Spondylocladium maculans* and the Diplodia-form were obtained both from the wood of the racks, and from the crêpe which was in contact with the wood. Each portion of the crêpe which was in contact with the wood was discoloured bluish or black, and reddish-yellow. The occurrence of the spotting at intervals is explained by the alteration in the position of the crêpe as drying progresses, thus presumably exposing a fresh surface to infection by contact with the wood of the rack.'

In continuation, it was further established in these researches that infection could occur both in the field by the transmission of spores to the latex, or take place in the drying house. Since most of the kinds of spores described occur in the air in abundance, the prevalence of spots on rubber only from one or two fields on an estate would possibly indicate that infection in such cases was derived from the field rather than in the factory.

In regard to *B. prodigiosus*, outside infection is indicated, possibly through the water placed in the tapping cuts Spotting due to this bacillus usually takes the form of an epidemic, which may affect only one or two weeks' output of rubber and then disappear for some time.

TREATMENT.

The methods of treatment suggested in the bulletin under consideration, will be described in the next issue of the *Agricultural News*.

AGRICULTURAL ENGINEERING.

Machine for Making Agricultural Lime.—Information is given in the *American Sugar Industry* for May 1913 concerning a machine for making ground limestone for agricultural purposes. The machine is constructed in various sizes, having capacities from 1 to 25 tons per hour, and requiring from 12 to 100 h.p to operate. A portable form mounted on a truck can also be obtained. In the operation of this machine, the stone (broken to a size of 3 to 4 inches) is shovelled in at the top of the pulverizer and comes out below, reduced to a product specially suited for agricultural purposes. The name of the firm of manufacturers is the Jeffrey Manufacturing Company, of Columbus, Ohio, U.S.A.

Machine for Extracting Rubber from Bark.—A new machine has been invented for the extraction of rubber from bark. The entire apparatus consists of an iron cylinder driven by motor. The necessary force is about 3 h.p. The cylinder, which is placed horizontally is pierced with numerous holes. Within is an arrangement of rollers and drums that act after the manner of a pestle and mortar. If a certain quantity of bark be introduced into the cylinder it gets finally crushed, and the débris is washed away by a stream of water, whilst the pure rubber remains in the drum. The cylinder is capable of containing 70 lb. of bark. It is considered that the machine produces in the minimum of time, as fine and pure a rubber as can be obtained by ordinary trituration. The name of the machine is La Valour. (From the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, March 1913.)

The breaking weight in wood beams 1 foot long, 1 inch broad, 1 inch deep, loaded at the centre and supported at ends is: English oak, 4½ cwt.; Canadian oak, 5 cwt.; pitch pine, 5 cwt. Wrought iron has a value of 18 cwt. The ultimate resistence of beams used for flooring, under distributed load, can be calculated from the formula: $W = \frac{2k \times b \times d^2}{l}$; where l = length in feet, b = breadth in inches, d = depth in inches, W = breaking weight in cwt., k = breaking value noted above.

It is usual to allow a factor of safety of one-fifth the breaking weight. (Mitchell's *Building Construction*, 1902.)

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

The Report of Mr. J. R. Jackson is as follows:—

At the first drug auction which fell on the May 1, the supplies were very much larger than they have been for some months past, but the demand was not at all what might have been expected, when it was known that there would be no other drug auction for a month, owing to the intervention of the Whitsuntide holidays.

Both hand pressed and distilled West Indian lime oil continue very scarce. Towards the close of the month cochin ginger dropped slightly, while mace and nutmegs showed a slight advance. The following prices ruled:—

GINGER.

At the first spice auction on the 7th of the month the offerings consisted of only 122 bags of Calicut, the whole of which was bought in at 35s. for good brown rough. A week later it was reported that some small sales of Jamaica had been made in London at steady prices. On the 21st the offering at auction amounted to 908 packages of Cochin and Calicut, but only 30 were disposed of, small Calicut fetching 36s, and brown rough Calicut 35s. Unsorted native cut. was bought in at 65s., washed rough Cochin, at 31s. to 32s.; brown rough Calicut, at 32s.; and bold at 40s. Some 115 bags of limed Japanese were also bought in at 23s. per cwt., while 100 bags of small brown African were withdrawn at 26s. per cwt. At the last sale on the 28th, 36 cases of small cut Calicut were sold without reserve at 36s. to 36s. 6d. per cwt.

NUTMEGS, MACE AND PIMENTO.

At the first and second spice auctions on the 7th and 14th respectively, there was no demand for nutmegs and no sales were made, but on the 21st, some 469 packages of West Indian were sold at the following rates. 64's to 68's, 7*d.* to 8*d*, 71's to 82's 5½*d.* to 6½d ; 83's to 93's, 5½*d.* to 5¾*d.*; 94's to 104's, 5*d* to 5¾*d.*; 117's to 125's, 5½*d.* to 5¾*d.*; some Eastern were also disposed of, at 5½*d.* for 78's, and 6½*d.* for 90's. At the same auction 69 packages of West Indian mace were sold at prices varying from 2*s.* 5*d.* for good, and 2*s.* 3*d.* to 2*s.* 4*d.* for ordinary to fair, and 1*s.* 10*d.* to 2*s.* 1*d.* for broken. Pimento was represented during the month by 68 bags, brought forward at the spice auction on the 21st and bought in at 2¼*d.*

SARSAPARILLA.

At the drug auction on the 1st of the month, sarsaparilla was well represented by 36 bales of grey Jamaica and 13 of Lima Jamaica and 15 of native Jamaica, 26 bales of the first named were sold at from 2*s.* 3*d.* to 2*s.* 6*d* per lb. The whole of the Lima Jamaica was bought in at 2*s.* 8*d.* per lb. and 2 bales only of the native Jamaica were sold at 9*d.* per lb. for common dull mixed. In consequence of the holidays, as before stated, the next drug auction did not take place till the 28th, when the offerings of sarsaparilla were as follows: grey Jamaica, 8 bales, all of which were disposed of; 15 bales of native Jamaica, which also found buyers; and 19 bales of Lima Jamaica, none of which sold. For the former, which was of fair quality, 2*s* 4*d* per lb. was paid, which was 2*d.* per lb., cheaper than the previous rates. Fair to good red native Jamaica, fetched 11½*d.* to 1*s.* and tawny, 10*d.* to 11*d.* The 19 bales of Lima Jamaica were all bought in at 2*s.* 8*d.* per lb.

CASSIA FISTULA, LIME OIL, TAMARINDS AND KOLA.

At auction on May 1, sixty baskets of cassia fistula from Java, were brought forward, and sold without reserve at 12*s.* 6*d.* to 13*s.* 6*d* per cwt., for lean to partly wormy: it was stated at this sale that 12 packages had arrived from Dominica.

In the early part of the month, 1*s.* 6*d.* per lb. was the price quoted for West Indian distilled oil of lime; at the end of the month, 1*s.* 8*d.* was being asked, while for hand pressed, 13*s.* 6*d.* was paid. Both kinds are very scarce. In the early part of the month it was announced that the arrivals of the new crop of tamarinds amounted to 145 barrels from Barbados, and 168 barrels from Antigua, 14*s.* per cwt. being quoted as the current price in bond. Kola remains very scarce, and in the early part of the month as much as 5½*d.* to 6*d.* per lb. was asked for the Javan produce. At the end of the month 4 bags of fair dried Grenada were offered, and two sold at 4½*d.* per lb.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, June 17, 1913; Messrs. E. A. de PASS & Co., June 6, 1913.

ARROWROOT—3¼*d.* to 5*d.*
BALATA—Sheet, 2/10; block, 2/- per ℔.
BEESWAX—£8 2*s.* 6*d.*
CACAO—Trinidad, 64/- to 74/- per cwt.; Grenada, 70/- to 72/-; Jamaica, 62/- to 72/-.
COFFEE—Jamaica, 56/- to 70/-.
COPRA—West Indian, £30 per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 14*d.* to 16*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Quiet. 37/- to 62/-.
ISINGLASS—No quotations.
HONEY—30/- to 41/6.
LIME JUICE—Raw, 1/4 to 1/10; concentrated, £21 to £22; otto of limes (hand-pressed), 14/3.
LOGWOOD—No quotations.
MACE—2/- to 2/7.
NUTMEGS—5*d.* to 6*d.*
PIMENTO—Quiet.
RUBBER—Para, fine hard, 3/9; fine soft, 3/7½; Castilloa, 2/5 per ℔.
RUM—Jamaica, 2/4½ to 6/- per gallon.

New York.—Messrs. GILLESPIE BROS. & Co., June 13, 1913.

CACAO—Caracas, 14½c. to 15c.; Grenada, 14¼c. to 14½c; Trinidad, 14¾c. to 15c.; Jamaica, 12½c. to 14c.
COCO-NUTS—Trinidad and Jamaica, selects, $34·00 to $36·00; culls, $20·00 to $21·00 per M.
COFFEE—Jamaica, 11c. to 13½c. per ℔.
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A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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The Significance of a Recent Publication.

THE Assistant to the Agricultural Advisor to the Government of India has lately reviewed* from the economic, and, perhaps one might add, from a purely personal standpoint, the recently published monograph on plant physiology and genetics entitled *The Cotton Plant in Egypt* by W. Lawrence Balls, M.A., Botanist to the Egyptian Department of Agriculture.

This review gives cause for comment, first of all, because some of the criticisms which it passed on Balls' work are unjust; that, however, to the general reader, is of less consequence than the circumstance that the review has a bearing on an extremely important phase in the development of tropical scientific research and education, and it is chiefly from this latter aspect that the opinions expressed in the review will be discussed in the present article.

The reader may be reminded that *The Cotton Plant in Egypt*, published as one of a series of science monographs (which includes Professor Biffen's *Improvement of Wheat and other Cereals* and *The Ascent of Sap* by Professor Dixon), brings together in an extremely condensed form, the various botanical investigations conducted by the author on the cotton plant to find out—to use plain words—exactly how it lives. The researches concerned the behaviour of the plant under varying conditions of environment, its physiological functions, its hereditary characteristics and the like, the quantitative results obtained, being presented in the form of graphs, formulae and diagrams in what is, mathematically, a most intelligent and concise arrangement. The book, in fact, is really an epitome of the author's numerous papers on the different aspects of the subject investigated during the past ten years.

Reserving, for the present, our own views as to the value and significance of the work, we may proceed first to outline those expressed in the article under discussion. The reviewer objects, at the outset, to the motive underlying the researches which the book describes—a motive which is regarded as narrow to an extreme. The chief reason for this opinion is the circumstance that during the course of the researches, the economic and utilitarian side of the subject was not sufficiently kept in view, with the inevitable result that 'the large amount of work here recorded does not appear to be of any immediate economic importance.' The reviewer objects, further, to the 'invidious distinction between pure and economic science, implied by the author,' and, practically speaking, considers the researches to have been neither of a 'pure' nor of an applied nature, but rather what may be metaphorically described as an unnecessary series of ingenious, energetic attacks with a brilliant torch of scientific method, into blind alleys of genetic and physiclogical darkness.

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* In *The Agricultural Journal of India* for April 1913.

According to the reviewer, *The Cotton Plant in Egypt* would seem to meet no definite demand, nor make any definite appeal. It would appear to comprise a discontinuous mass of accurate information, unintelligible to the agriculturist, of doubtful educational value (in its broadest and best sense) to the student, a concentrated *prècis* of technical research that should neither monopolize the labours of the specialist in abstract science, nor constitute, under any conditions, the duties of an official of an Agricultural Department.

The outcome of these opinions provides the object of the review, which was written, it is stated, in defence of those agricultural scientists who are no less agricultural than scientific.

Although a limited agreement may be expressed with the reviewer's ideas—and there is much to be said in favour of those concerning the mental outlook of an investigator—still the statement that Mr. Balls' book 'does not appear to be of any immediate economic importance', even if it were true, cannot be regarded as signifying necessarily that the book serves no useful purpose. *The Cotton Plant in Egypt*, it must be admitted, gives no simple recipes for making new types of cotton plants, nor is there any scope, in the method of presenting the results, for preparing easy generalizations to the solutions of problems and the cost of carrying them out. But, on close examination, we find results concerning the relationship of the root system of the cotton plant to the changes in the level of the water induced by irrigation; information that the loss of cotton attributed to cold and fog was due to a specific fungus; a solution of the mechanism and causes of boll-shedding (due to root asphyxiation); work on the inheritance of variations in the number of loculi in the boll—a matter which directly bears upon yield per acre; and, finally, the discovery of the 'pot bound' nature of the roots of cotton plants growing under field conditions. These are surely matters of great economic importance on which Mr. Balls has shed considerable light.

With such facts, no doubt, the writer of the review would be in agreement, but he might possibly contend that they are not presented in such a way as to be be readily assimilable by the layman. But even the author admits that his book was compiled for the botanist rather than for the planter, and since the book is practically a summary, it is essentially a work of reference for advanced students of genetics and physiology and for investigators in the less abstract branches of the subject it treats of. It is a source which requires tapping. It is a store of information which general workers in agricultural science may draw upon and incorporate in popular writings and addresses. It is a book which marks the commencement of the new phase of tropical scientific research—a phase of close specialization. The results of these Egyptian researches are not meant directly for the general public any more than are those emanating from, say, Rothamsted, in England, or from the Hawaiian pure research laboratories, in spite of the fact that these latter studios are supported—actually paid for—by the practical planters in those islands.

When one comes to consider the matter, the scientific investigation of a crop of such vast economic importance, and of such plasticity and power of response as cotton, is no lower in status than the study of the soil or the physiology and pathology of the rubber tree. The ultimate benefit from such studies is cumulative rather than revolutionary. There is nevertheless no doubt that such work is more easily conducted, more usefully presented and appreciated, if carried out in contact with other workers under academical surroundings rather than under the somewhat isolated circumstances of the various Agricultural Departments at present existing in different parts of the Tropics. The *Cotton Plant in Egypt* is, therefore—putting aside its intrinsic value—at least of great significance as an appeal from the Tropics for the endowment and centralization of education and research.

The rcent issues of *Nature*, for June 19 and 26, contain agricultural reviews of two new publications of considerable importance, namely, *Mendelism and Stock Breeding*, by Professor James Wilson, and *Mosquitoes* (of North and Central America and the West Indies), by L. O. Howard, H. G. Dyer and F. Knab. These works will receive further consideration in the *Agricultural News* in due course.

SUGAR INDUSTRY.

LOUISIANA AND SYRUP-MAKING.

The critical position of the sugar industry in Louisiana led recently to an interesting and instructive discussion at a meeting of the Sugar Planters' Association of that State. The proceedings have been very fully reported in the *American Sugar Industry* (April 1913), and from this source the following information has been abstracted.

In the course of his speech, Dr. Stubbs, who addressed the meeting first, examined the probable condition of the industry in Louisiana under free trade in sugar and under the preservation of the tariff, respectively. With a continuation of protection, the speaker foresaw an enormous increase of the area in the West under beet. This would mean a large increase in the number of beet factories, and a correspondingly large output of high-grade granulated sugar.

Such development would react unbeneficially on Louisiana: 'Every beet factory added to the West means a diminution of the capacity of our refineries, and in ten years, with a prosperous development of beet factories, we shall have few, or no refineries throughout the East.'

The best response to such a change would be to produce syrup. 'If', the speaker continued, 'we can get a demand for syrup by which the price can be kept up above twenty or twenty-five cents a gallon, we are sure that it will be equally as profitable, if not more so, than making sugar at present prices. An ordinary gallon of syrup, with 35 per cent. of water, which the Government allows, contains about five pounds of sugar and, at the present price, is worth about twenty cents; therefore, it will be found that, if we can get above twenty cents for syrup, that it will be equally as profitable as making sugar at four cents per pound, and dispensing with high-priced machinery.'

Under a tariff, then, it would appear that Louisiana must make syrup or else pure white sugar.

If, on the other hand, however, free trade were instituted, it would still be no longer profitable to make sugar, since at 3c. per lb. the manufacture cannot pay. In any case, then, the question of adopting syrup-making in the near future was one for most serious consideration.

Mr. Irving Morse, supervising chemist for the Louisiana Sugar Company, then took part in the discussion. He referred to the fact that the manufacture of table syrup and the out-turn of white sugar are so closely allied that the same principle applies to both. Colour and flavour are of primary importance, and since Louisiana can make high-grade syrup in the course of the production of white sugar, there was no reason why it could not specialize in the production of syrup for table purposes on a large scale. He believed the idea that Louisiana can continue to compete with Cuba in the manufacture of 96° test sugar was a thing of the past, and that if the former were to continue in the sugar business they would have to turn their attention either to white sugar or to syrup.

SUGAR-CANE TOPS FOR ENSILAGE.

Considerable difficulty is experienced during the drier months in certain parts of the West Indies in the matter of providing fodder for estate animals. An article in the *Louisiana Planter* (June 14, 1913) deals with the question of the possibility of utilizing cane tops for ensilage, and such of the information as is thought likely to be of practical interest under West Indian conditions has been abstracted as follows:—

Professor W. R. Dodson, Director of the Louisiana Experiment Station, by whom the paper referred to above was prepared, deals firstly with an experiment conducted with various green crops for the purpose of determining the quality of ensilage they would make. In regard to the tests with sugar-cane tops, it was found that the cattle consumed the ensilage made from it very well, but they were not disposed to like it as much as corn ensilage. However, the cane ensilage seemed equally as palatable as sorghum ensilage. Two tables of figures are given showing the composition of the cane tops before fermentation and after. These indicate that a very material decrease in the carbohydrates takes place, though the acidity was not excessive. The percentage of water increased, whilst that of both ash and protein decreased. In general, it may be stated that these analyses show that, as far as can be judged, cane tops make a fairly good quality ensilage. It is intimated further that the relatively large amount of sugar present in cane tops would not be likely to be followed by excessive acetic fermentation in the silo.

The author next proceeded to make use of the figures of analysis with a view to showing the actual feed value of the ensilage. A calculation is given which makes it evident that 1 ton (2,000 lb.) would contain 318·80 feed units.[*] A ton of cane top ensilage, therefore, carries the equivalent of more feed units than 5½ bushels of corn.

Although the feeding value of cane ensilage may be regarded as having been established, the practicability of making the foodstuff on the estate is another matter. A suggestion is put forward that while inventors are seeking to introduce a cane-harvesting machine, it might be well for them to consider the possibility of using a machine in the field that will simply cut the cane without stripping it of green leaves, hauling tops and leaves to the factory where machinery might more readily strip and top the canes, preparing the canes for the mill and the tops and leaves for the silo.

This led the writer to consider the subject of cane itself as a feed. It is stated that 2,000 lb. of cane contains 370 feed units. The statement is also made that corn ensilage would contain 341 units, being 29 units below those in a ton of cane ensilage.

The writer's figures in general show that as regards the theoretical feeding value, cane ensilage is superior to that made from corn. In practice, however, at least in the West Indies, it would never be profitable to grow cane by the acre for ensilage, though there might not be so many objections to the cultivation of corn for this purpose. In this connexion reference may be made to articles appearing in the last issue of the *Agricultural News* on the cultivation of corn, and the suggestion here put forward that the leaves may be a value for feeding estate animals may be considered an additional argument in favour of the subject there discussed.

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[*] Professor Dodson calculates the number of feed units in 100 lb. of foodstuff as follows: percentage of carbohydrates +(percentage of fat × 2·25)+(percentage of protein × 2·5). Some authorities employ 2·5 as the fat equivalent—[Ed. *Agricultural News.*]

FRUITS AND FRUIT TREES.

THE PHILIPPINE COCO-NUT INDUSTRY.

Coco-nuts have been planted in the Philippines for a large number of years, but it was not until about 1890 that the fruit was produced on a large scale for the production of oil and copra. The older groves planted many years ago are described in a recent bulletin (No 25 of the Department of Public Instruction Bureau of Agriculture of the Philippine Islands) as being extremely badly arranged. In some of these it is stated that the denseness of the trees is very excessive, some 250 to 500 trees per hectare are to be found, instead of 100 or 150, which is a normal number. Recently, however, this error has been realized and, generally speaking, the young groves are now very much better laid out and more properly managed.

Most of the Philippine copra is at present partially dried over a tapahan or kiln. A considerable quantity, however, is sun dried, it having been found easier to produce a higher priced article, and one which has the advantage of containing no creosote as does the smoky product of the kiln. Artificial products from patent driers are coming into use, and it is believed the general adoption of this method will greatly improve the status of the Philippine copra market. At present the copra from this territory ranks very low with the quality of the same article from other countries. The necessity for improved methods of preparation is rendered evident when the circumstance is considered that the Philippines produce about one-fourth of the world's copra supply. The industry is increasing rapidly, the copra exports for 1912 being 46 per cent. greater than in 1911 (fiscal year).

At present the Philippine coco-nut plantations are comparatively free from insect pests and fungus diseases; the rhinoceros beetle is more or less common throughout the Archipelago, and in most locations, adjacent to wooded areas, wild pigs and deer are usually found in such numbers that young groves, unless fenced, are liable to be severely damaged.

In conclusion, it is pointed out in the bulletin that the prospect for high prices for copra, coco nut oil, and fresh nuts in the Philippines is good. The returns, with careful management, should at the end of the ninth year be enough to pay for the bringing in of the plantation, and dividends ranging from 10 to 75 per cent. according to local conditions and management may be expected from the tenth to the 100th year.

NOTES ON TREES IN BLOSSOM AT DOMINICA.

The following observations forwarded by Mr. Joseph Jones, Curator, Botanic Gardens, Dominica, should be of very general interest. Several of the beautiful flowering trees referred to might be more widely grown in the West Indies.

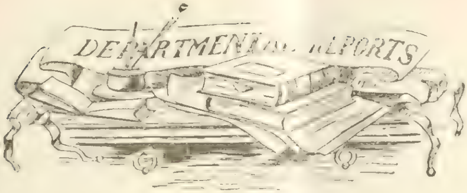
A specimen of the Moreton Bay Chestnut, *Castanospermum Australe*. growing in the Botanic Gardens, Dominica, has recently flowered and fruited. The tree, which belongs to the Natural Order Leguminosae, possesses handsome foliage and produces pea-like flowers of an orange colour. The flowering and fruiting of this tree for the first time in Dominica is a matter of botanical interest only. The fruit despite its name, is of little value. It is stated in the 'Treasury of Botany' that although the fruit has been extolled and placed upon an equality with our chestnuts, they are in reality not much superior to acorns, and have an astringent taste; they are improved by roasting and no doubt proved acceptable to the travellers who first visited Moreton Bay.

Another papilionaceous tree in the Dominica Gardens which has made a brilliant display of flowers lasting over a period of several weeks, is the Dhak tree of India, *Bueta frondosa*. The Treasury of Botany states: 'when in full flower the Dhak tree is a gorgeous sight, the masses of flowers resembling sheets of flame, their orange red petals contrasting brilliantly against the jet black velvety calyx.'

This tree, which yields Bengal Kino, is of considerable economic importance to the natives of India.

During the dry season, excellent displays were made by the fine flowering trees, *Cassia grandis* and *Cassia nodosa*. Both these trees might be widely grown in the West Indies on account of the beauty of their flowers and the considerable period—six to seven weeks—during which they remain in blossom. Under good conditions the trees commence to flower when about three or four years old.

The study of nuts with special reference to their microscopic identification is described in *Bulletin No. 160 of the Bureau of Chemistry*, United States Department of Agriculture. Most of the investigation concerned fruit which grows in temperate latitudes, though the almond and the cashew nut of the Tropics are dealt with at some length. It is noted in regard to the latter, that the starch grains are mostly 5 to 12 microns in length, and strongly resemble a leguminous starch or that of the acorn.



ANTIGUA: REPORT ON THE BOTANIC STATION AND EXPERIMENT PLOTS, 1911-12

In this, as with all the Botanic Station Reports issued during 1913, a new system of headings has been introduced which, it is hoped, will indicate in a distinct manner the significance and relationship of the different sections, giving prominence to matters of general interest by the placing of administrative details near the end.

DROUGHT-RESISTANT TREES.

During the year under review the work in the Antigua Botanic Gardens was seriously hampered through drought. At the same time the occurrence of the dry weather afforded an opportunity for making observations as to what plants are best adapted to resist it. In this connexion it may be noted that, among the palms that withstood the drought were *Attalea Cohune*, *Sabal mauritaeformis*, *Coryphia elata* and *Elaeis guineensis*. On the other hand, a whole avenue of Royal palms, some of which were 35 feet high, died from the effects of the weather.

VALUE OF EUCALYPTS.

The section dealing with work in the nurseries, which follows, is characterized by the large number of lime and coco-nut plants that had been distributed, in spite of an inclement season; whilst in regard to plant importation, the establishment of several more species of Eucalyptus is a matter for much satisfaction. Of these trees, *E. cornuta* and *E. rostrata* have proved themselves splendid drought-resisters, whilst the wood of the latter has been under the soil in the garden for several years, and may with confidence be looked upon as being suitable for underground work.

PROVISION CROPS.

Trials with provision crops, particularly with varieties of sweet potatoes have been conducted for several years at the Experiment Station, and the fact that during the last three years more than 147,000 cuttings were distributed from the plots, shows that these experiments have, even as a means of supplying the planting material during drought, justified their existence. The trials with cassava have given interesting results, in that the yields showed a decided increase, in spite of the drought, over the previous years' returns. The results derived from the different varieties should be of particular interest and value to small growers, who are naturally to a large extent dependent upon provision crops.

RESULTS OF COTTON SELECTION.

The experiments with cotton have included the usual trials with selected seed of different types at the Experiment Station, together with special selection work conducted on better soil at Yeptons. Cotton selection was commenced in Antigua in 1906, and since that year the work has been carried on systematically. The greater part of the cotton grown in the island is from cotton selected since the above date by the Department of Agriculture. It is more than probable that the increased yields now obtained are, in part, due to the efforts made in connexion with this work. One of the most interesting features of the special selection work referred to above is the hybridization of different types along Mendelian lines, the greatest promise being shown in this connexion in a case of crosses between Sea Island and native St. Eustatius plants.

ESSEX RAPE AS A FODDER CROP.

The report under review continues with a discussion of the value of certain green dressing and fodder crops. In spite of the drought, it was found possible to conclude that, of the plants tried in Antigua during the past few years for green dressing purposes, *Tephrosia candida* and the Barbuda bean (*Phaseolus lunatus*) are two which have stood the local conditions best. Inconclusive trials were made with the Jerusalem pea (*Phaseolus trinervis*) and the cowpea (*Vigna unguiculata*). An extremely interesting experiment was the trial of the dwarf Essex rape as a fodder crop. The fattening properties of this plant are said to be greater than those of clover. It has been tried on several occasions in Antigua and fair results have always been obtained. During the year under review, fodder at the rate of 15,600℔. per acre was yielded in four months' time.

The cultivation of soy bean (*Glycine hispida*) continues to be persevered with.

DISEASE FACTOR IN CULTIVATION.

The description of work connected with insect and fungus pests, which next receives attention, again indicates that root disease, flower-bud maggot and scale insects are, respectively, factors that have to be seriously considered in the cultivation of sugar cane, cotton and limes, in Antigua. Two newly suspected pests of cultivated plants are hard back grubs in connexion with sugar-cane, and a weevil found on cotton.

GENERAL PROGRESS DURING 1911-12.

The succeeding section in the report on progress in the chief industries is interesting from a historical point of view. Reference is made first of all to the fluctuating yields of cotton during the past nine years, and it is pointed out that insect pests must be considered as constituting the factor mainly responsible for the decreased yields during 1903-9. In regard to the sugar industry, the lower yields that have been obtained during the past three years are attributed to the effects of a series of dry seasons In this section a few notes are added concerning the sugar-cane experiments, on which a separate report has just been issued for 1911-12.

As regard progress in the minor industries, coco-nut cultivation and the planting of Jequié Maniçoba rubber, though in their initial stages, show promises of development. Proceeding with questions of general agricultural progress, interesting facts are given in regard to implemental tillage in Antigua, and to some new means of manuring. The notes on modern sugar making which follow, describe the alterations and additions that have been made in the Central Factory, and the final chapter in this section dealing with timber production and reafforestation matters, involves problems of the greatest importance to Antigua.

The report concludes with information showing that satisfactory progress has been made in educational matters, at the Grammar School, but more especially in connexion with the Reading Courses Examinations, due, in great measure, to the assistance and encouragement given by the Local Department of Agriculture.

A useful appendix will be found at the end of the publication containing, with few exceptions, a complete list of the flowering plants at the Botanic Station.

COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date June 30, with reference to the sales of West Indian Sea Island cotton :—

Since our last report about 400 bales of West Indian Sea Islands have been sold; these are confined to St. Eustatius 15½*d.* to 20*d.*, St. Kitts 19*d.* to 21*d.*, St. Vincent 21*d.* to 24*d.*, with some superfine lots at 30*d.*, and Stains at 8½*d.* Spinners have confined their attention to these particular growths owing to their fineness.

Owing to the great strength of Sakellarides Egyptian, which sells at about 12*d.* per lb., spinners find that for all their coarser yarns they can obtain as good results from this as from the coarser and poorer qualities of West Indian and American Sea Island. The result is that the coarser kinds are very much neglected. For the very fine yarns, Sakellarides is not suitable, and we should therefore strongly recommend all planters in selecting their seed to cultivate for fineness.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending June 21, is as follows:—

The market has remained dull with very limited demand. Factors are concerned by the absence of interest in the unsold stock, which they are desirous of selling and are disposed to meet the views of buyers in a limited way.

The following quotations represent the views of the Factors, viz:—

Extra Fine	28c. to 29c.	= 16*d.* to 16½*d.*	c.i.f., & 5 per cent.
Fully Fine	26c. to 27c.	= 14¾*d.* to 15¼*d.*	,, ,, ,, ,,
Fine	25c.	= 14¼*d.*	,, ,, ,, ,,
Extra Fine off in preparation	24c. to 26c.	= 13½*d.* to 14½*d.*	,, ,, ,, ,,
Fully Fine off in preparation	22c.	= 12½*d.*	,, ,, ,, ,,
Fine off in preparation	20c.	= 11½*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to June 21, 1913, were 2,106 bales, 5,714 bales, and 4,675 bales, respectively.

It is stated in the Antigua *Sun* (June 17, 1913), that at a recent meeting of the Agricultural and Commercial Society the challenge cup for cotton, presented by the British Cotton Growing Association for open competition, was awarded to Mr. A. Edwards of Room estate. The challenge cup for stock, presented by His Excellency Sir Bickham Sweet-Escott, was finally won by Mr. E. D. Dew.

In the Eighth Annual Report of the British Cotton Growing Association, reference is made to the continuation of the co-operation which has existed for many years between the Association and the Imperial Department of Agriculture. It is stated that the Council must again record their thanks to the Imperial Commissioner for the invaluable services rendered to the industry.

AGRICULTURAL ENGINEERING.

A PRACTICAL FLOORING FOR PIG-STYES.

A strikingly ingenious basin-shaped floor for pig-styes is described in the *Monthly Bulletin of Agricultural Intelligence and of Plant Diseases* (April 1913).

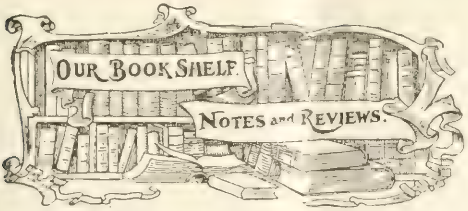
The size of the floor is about 9 feet 9 inches square, with a fall in the centre of about 5 inches. A covered drain crosses it throughout its length. An approximately semi-circular concrete or brick rim, 4 inches wide and 6 inches high, divides the floor into the part for the litter and the part for the droppings. The interesting fact has been observed that pigs prefer leaving their droppings against the wall farthest from the trough where the floor is somewhat higher. The semi-circular rim therefore marks off this area from the central portion. The urine follows the outside of the rim and falls into the drain without wetting the straw, thereby preserving a condition of dryness which, for pigs, is desirable.

Another advantage offered by this ingenious arrangement is that the straw, through the movement of the pigs, tends to collect in the lowest part just where the animals like to lie; consequently they always rest on the straw instead of on the bare floor.

For brood sows, a wooden disc about 28 inches in diameter is fastened to a post reaching down from the roof to 12 inches above the lowest part of the floor. Under this disc, the suckling pigs can crawl and avoid being crushed by the mother.

A New Hoisting Device.— A novel and apparently satisfactory machine for the economical handling of sugar-cane is described in the *Modern Sugar Planter* (May 31, 1913). It is stated that the invention not only facilitates the handling of the cane, but also permits it to be done with more despatch and at less cost. Operated either by horse power or by a small gasolene engine or electric motor, one man can easily perform the entire task of unloading the carts, weighing the cane and placing it in cars. A system of cog wheels is so arranged that by the movement of the lever the operator lifts the cane, which while suspended in mid air, is accurately weighed by an automatic scale attached to the derrick. A second lever releases the cogs and permits the easy swinging of the load on a ball-bearing turnable to any desired position. The load is unfastened and released by simply operating a third lever. It is stated that a company has been organized for the manufacture and sale of this wonderful piece of mechanism, which, no doubt, will be advertised in the ordinary way in due course.

An interesting note appears in the *Experiment Station Record* (Vol. XXVIII, No. 5) concerning some recent tests to determine effects of grade and surface of roads on tractive force. The tests were made on dirt, cinders, asphaltic concrete, and brick materials. One result obtained was that on a dirt road, a team can pull up a 10-per cent. grade only two-ninths of the load that it can draw on the level. The general conclusion is that in determining the permissible grade it is necessary to take into consideration the probable weight of the load to the haul, the average type of horse, and the effect of atmospheric conditions, particularly of rain, on the chosen road materials, in their relation to draft and footing for the horse.


OUR BOOK SHELF.
NOTES and REVIEWS.

FARM MANAGEMENT: By G. F. Warren, Ph. D. *The Macmillan Company*, New York, 1913. Price 7*s.* 6*d.*

Judging by its title, this book would not seem to concern agriculture in the tropics, nor does an examination of a page here and there tend to dispel this impression, for the information is applied almost entirely to conditions obtaining in the temperate regions of the United States.

If, however, the motive of the book and the principles involved be regarded broadly, much that is highly suggestive and illuminating will be found even by those who manage land in warmer latitudes.

Farm management is the study of the business principles in agriculture—the science of farm or estate organization. It seeks to show how, under various conditions, a maximum continuous profit can be obtained. Its problems concern types of farming in relation to climate, soil, distance from markets, capital, labour, competition and numerous other factors. It deals with questions of intensive and extensive cultivation, with the financial side of maintaining the fertility of land, with methods of renting, farm equipment and the arrangement of fields and buildings. The time and ways to place produce on the markets and practicable methods of scientifically keeping accounts are also important branches of this interesting study. To understand what a great deal there is to be learnt concerning all these matters the reader must refer to the 600 pages of concise and well-classified information constituting the book under review.

The movement in the direction of the distributive or economic side of agriculture in contra-distinction to the productive is of quite recent origin. One of the pioneers of the movement in America was Professor Card, whose well known work on Farm Management has frequently been referred to in the *Agricultural News*.

The present treatise on the subject, equally powerful, involves similar ideas, but deals with them in greater detail. The book is practical and sound, and it therefore goes a long way to prove a fallacy in the old adage 'Farming cannot be taught.'

INSECTICIDES, FUNGICIDES, AND WEED KILLERS: by E. Bourcart, D.Sc. *Scott, Greenwood & Son.* London, 1913. Price 12*s* 6*d*.

This book, comprising some 400 pages, is described on the title page as 'a practical manual on the diseases of plants and their remedies, for the use of manufacturing chemists, agriculturists, arboriculturists and horticulturists', and will be welcomed as a valuable addition to the working equipment of those for whom it is intended.

In the preface the author refers to the increasing necessity for knowledge to enable those who have to do with the raising of plants of all kinds, to combat pests and diseases. The great mass of records of experiments and trials by workers in all countries has been reviewed, and from the aggregate of the results reported, the author has endeavoured to frame certain scientific rules which appear to determine the success of certain classical methods, and to explain certain notorious failures.

The translator's preface refers particularly to the enormous value of the great number of tried recipes—recipes which have passed the ordeal of a capable and wise censorship—embodied in this treatise for the benefit of every class of workers connected with agriculture.

A perusal of the table of contents reveals an admirable systematic arrangement of the subject-matter. Each chapter deals with a substance and the groups of its derivations, whilst under the headings thus provided are sub-headings including preparation, properties, action on plants, action on insects, and use.

The introduction devotes twenty-two pages to a general discussion of the nature of the causes and treatments of diseases of plants, and this brings out the general circumstances connected with the several points as they recur in succeeding chapters of the book.

As a concrete example of the method of treatment, reference may be made to the chapter where Bordeaux mixture (Bouillie Bordelaise) is dealt with. Here (p. 227) one finds the heading: copper hydrate (Bouillie Bordelaise)—Preparation. Under it, an account is given of the method of preparing Bordeaux mixture, the formula recommended consisting of 10 ℔. blue vitriol (copper sulphate), 3½-10 ℔. lime and 50 gallons of water, which is given as a 1-per cent. solution. Under the heading Properties of Bouillie Bordelaise, it is stated that this fungicide should be neutral or slightly alkaline, it must never contain an excess of blue vitriol. The tests given for determining the neutrality of the mixture are the usual ones, namely, the red colouration produced by adding a few drops of yellow prussiate to a small quantity of the mixture, and the knife-blade test.

To ensure the proper adhesion of Bordeaux mixture, it is necessary (1) that the solution of blue vitriol should be added cold to the milk of lime, (2) the better the quality of lime the better the adhesion, and (3) the fresher the mixture the better the adhesion. The chapter includes a historical account of the use of Bordeaux mixture, of practical spraying, and of its use against mosses and lichens, bacteria and fungi. The treatment of tubers and stems is discussed, and then follows an account of the use of the compound against each one of a long list of parasitic diseases of plants, together with a short account of the effect of Bordeaux mixture against insects.

In the glossary, of twenty-four pages, will be found, arranged in alphabetical order, brief accounts of the pests and diseases mentioned in the body of the work, which will help the reader to identify many of those mentioned under the heading of the remedial treatment previously discussed.

It is not of course to be expected that a work of this sort should be entirely free from error; but one is inclined to regret that such a statement should appear as that on page 363, to the effect that the Gipsy Moth (*Ocneria dispar*) has been exterminated in America by the use of creosote applied to the egg-masses, followed by spraying the young caterpillars with arsenate of lead. This treatment was efficient, but with its cessation for a few years, there came a general distribution of the Gipsy Moth, and now, in addition, large sums of money are being spent yearly for importing parasites with the object of preventing any further spread of the insect. The above mis-statement, however, does not in any way detract from the general usefulness and reliability of the work.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents and not to the Department.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

In the editorial of this number of the *Agricultural News* a review of a recent publication is criticized with the object of emphasizing the ultimate economic value of abstract research in agricultural science.

Under the heading Sugar Industry, will be found an article describing results of experiments on the feeding value of cane-top ensilage.

An ingenious type of flooring for pig-styes is briefly described in an article on page 230.

Under the caption Book Shelf, on page 231, appear reviews of a recent work on Farm Management and of another on Insecticides, Fungicides and Weed-killers.

Interesting articles concerning the corn ear worm and the control of froghoppers will be found under Insect Notes, on page 234.

As a sequel to the recent bulletin on the preparation of Para rubber, lately abstracted in the *Agricultural News*, an article reviewing the information there set out, has just appeared, and this is summarized on page 235.

Fungus Notes, on page 238, comprise an account of a new disease of the castor plant. The concluding article on this subject and that on the spotting of plantation Para rubber will appear in the next issue.

Reducing Rubber Prices to Encourage New Uses.

The *India Rubber World* (June 1, 1913) pays considerable attention to the recent interesting proposal emanating from the English financial press, to the effect that rubber plantation companies should agree to set aside 10 per cent. of their crops to be held at the disposal of certain English and American manufacturers at the fixed price of 2*s.* 6*d.* (60 cents) per lb., to be used solely for purposes not hitherto exploited. If adopted, this project would place at the disposal of manufacturers this year about 4,000 tons of plantation rubber at 60 cents per lb.

The above-mentioned journal considers that it would be easy to find manufacturers who would religiously live up to this arrangement, but doubt is expressed as to whether any substantial end would be gained by the project.

The fundamental idea, of course, is the utilization of the 10-per cent. cheap rubber solely for purposes of experimental manufacture. If a new article were produced which did secure recognition, would it necessarily pay to manufacture it on a large scale at the full market price? If the project materialized it would appear to seem necessary to have a clear understanding that activity should be directed to the invention of new articles on strictly economic lines.

Although an extension in the number of uses of raw material will increase the demand for it, a much greater response is occasioned by a reduction in the cost of production. This particularly holds good for a commodity like rubber for which the demand is economically very elastic. The conclusion cannot be avoided that the 10-per cent. reduction might in the case of this product be more wisely expended by producers upon an investigation of problems of production rather than upon those of manufacture. With a commodity like sugar, of which the retail price is relatively low, a parallel action to that suggested above would be likely to prove of much greater benefit—provided it were possible to discover new and original ways of utilization.

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The Honey Bee and Pollen Collection.

In *Bulletin No. 121 of the Bureau of Entomology*, United States Department of Agriculture, is published a very interesting and instructive paper on the behaviour of the honey-bee in pollen collecting. The following information is abstracted from the summary with which the paper concludes.

Pollen may be collected by the worker bee upon its mouthparts, upon the brushes of its legs, and upon the hairy surface of its body. When the bee collects from small flowers, or when the supply is not abundant, the mouthparts are chiefly instrumental in obtaining the pollen. The specialized leg brushes are used to assemble the pollen, collecting it from the body parts to which it first adheres, and transporting it to the pollen baskets or corbiculae of the hind legs. In this manipulation the forelegs gather pollen from the mouthparts and head; the middle legs, from the forelegs and from the thorax; the hind legs, from the middle legs and from the abdomen.

Pollen grains are moistened and rendered cohesive by the addition to them of fluid substances which come from the mouth. Analyses show that honey forms a large part of this moistening fluid, although nectar and secretions from the salivary glands are probably present also.

In the process of pollen manipulation this fluid substance becomes well distributed over the brushes of all the legs. The forelegs acquire moisture by brushing over the mouthparts, and they transfer this to the hairs of the breast and to the middle leg brushes when they come in contact with them. The middle leg brushes transmit their moisture to the pollen combs of the hind legs when they rub upon them. All of these brushes also transport wet pollen, which has come from the mouth parts and thereby acquire additional moisture. Dry pollen which falls upon the body hairs becomes moist when brought into contact with the wet brushes or with wet pollen.

Pollen which the collecting bee carries to the hive is deposited by this bee within one of the cells of the comb. As a rule, this pollen is securely packed in the cell by some other worker, which flattens out the rounded masses and adds more fluid to them.

◆

Botanical Studies in the Virgin Islands.

The Director-in-Chief of the New York Botanical Garden gives an interesting description in the Journal, issued by the Directors, of a voyage in the northern West Indian islands, made chiefly with the object of studying the different species of the genus Cactus. Of most general interest is that part of the paper which deals with the botanical characteristics of the Virgin Islands. Reference is made first to the exploration of Tortola. The existence in this island of a small area of primaeval forest which contains many rare and characteristic species was one matter that caused the display of much interest. The author expressed pleasure on learning that steps may be taken toward the permanent preservation of this high altitude flora and the possible reafforestation of denuded areas adjacent

The next island dealt with is the botanically little-known Anegada. This island, physiographically and geologically is totally different to all other islands of the archipelago. Its native flora contains many species not known to occur on the other Virgin Islands and as a whole it is strikingly Bahamian in relationship. In this island 123 species were collected. The author states that a more thorough botanical survey would be a notable contribution to geographic botany; the flora is highly specialized, and very few specimens from Anegada are preserved in any museum or herbarium. Two kinds of palms exist wild, whose botanical affinities are as yet unknown, inasmuch as neither flowers nor fruits of them have been scientifically observed. Specimens of their leaves were brought away, and one palm was found to be a palmetto (Sabal) the other a thatch palm (probably Thrinax).

The Presence of Arsenic in Plants.

For some years it has been known that arsenic is normally present in the body of animals. Of late it has been shown that this very poisonous element commonly exists in plants, though of course in quantities which are far too small to allow of any injurious physiological action on the animal system. As a matter of fact it would appear that arsenic when present in certain quantities and in certain forms, is an important nutrient.

Figures are given in an article in the *Monthly Bulletin of Agricultural Intelligence and of Plant Diseases* for February 1913, which show to what extent the substance is present in plant tissue. Fresh orange pulp contains 0·011 mgr. per 100 grms; the dry material, 0·099 mgr. Fresh tangerine orange pulp has 1·012 mgr.; the dried pulp, 0·085 mgr. Lettuce has quite an appreciable amount of arsenic, dry leaves containing as much as 0·387 mgr. Banana pulp appears to contain 0·006 mgr. in the fresh material and 0·033 mgr. when dried. In fresh rice and maize 0·007 mgr. and 0·030 mgr., respectively, were found; whilst the dry materials contained 0·008 mgr. and 0·036 mgr., respectively.

Even parasitic plants, which do not come in contact with the soil, contain arsenic; but although it is indispensable for their proper development there is no relation between the amount of arsenic in the parasite and that contained by the host plant.

In any individual plant, the green parts contain more arsenic than those which are not exposed to the light.

◆

Taxation of Jamaican Bananas.

From recent telegrams many will be aware of the fact that considerable consternation has arisen in Jamaica as the outcome of a report that the United States Government has decided to impose a duty on imported bananas. Of the 40,000,000 bunches of this fruit annually received into the United States some 17,000,000 are sent from Jamaica; and if, as has apparently been urged, a 5 cent tax on each bunch is put in force, the stability of Jamaica's principal industry will be severely shaken.

According to a telegram published in the *Financial News* (June 26, 1913) the action of the United States will be more particularly felt since the duty is to be imposed per bunch irrespective of size. The majority of stems sent from Jamaica are very small compared with those exported from Costa Rica and elsewhere so that under such a system unfair competition is set up between Jamaica and other banana-producing territories. In particular, it will be the peasant-growers in Jamaica who will be worst affected if the Tariff Bill becomes law.

It is understood that representations have been made to the Home Government with a view to expressing the desirability of sending a deputation from Jamaica, for the purpose of laying the Colony's claims before the American authorities.

INSECT NOTES.

THE CORN EAR WORM ON RICE.

In the *Journal of the Board of Agriculture* of British Guiana for April 1913 (Vol. VI, No. 4) there is an interesting article by G. E. Bodkin, B.A., Government Economic Biologist, which, under the heading The Rice Caterpillar, gives a very complete account of the life history of *Laphygma frugiperda*, and describes its attacks on rice in that colony.

POPULAR SYNONYMY.

This insect has frequently been referred to in the *Agricultural News* (See Vol. IV, p.90; Vol. X, p.74; Vol. XI, p. 346) as a pest of Indian corn attacking the leaves and ears, and of cotton, attacking the bolls in the same way as the boll worm (*Heliothis obsoleta*).

In the United States, *Laphygma frugiperda* is commonly called the fall army worm. In the Lesser Antilles it is known as the corn ear worm, and is often confused with the cotton boll worm when it attacks cotton: and, now, because of its occurrence as a pest of rice, it receives the common name of rice caterpillar.

This insect is of very wide distribution through North, South and Central America and the West Indies. In addition to the food plants already mentioned (corn, cotton and rice) sugar cane, grasses, clover and peas have been attacked by it.

METHODS OF CONTROL.

In connexion with the control of the rice caterpillar the use of dry, powdered lead arsenate is recommended when this method can be adopted. Flooding the rice nursery beds is also believed to be a valuable means of control. The caterpillars come to the surface of the water, where they may be collected by hand, and then destroyed.

Wild birds are useful aids to control, and Mr. Bodkin suggests that perches should be erected to attract them to the vicinity of the nursery beds.

NATURAL ENEMIES.

Laphygma frugiperda is controlled to a certain extent by several natural enemies. A few of these, which occur in British Guiana, are a hymenopterous parasite, a lady-bird beetle, and a wasp, *Polistes nigriceps*: all of these attack the insect in its larval stage. No egg parasites have as yet been found in British Guiana. The following account of a parasite of *Laphygma frugiperda* in the United States is taken from the same number of the *Journal of the Board of Agriculture* of British Guiana that contains the account of the rice caterpillar:—

'Issue No. 6 of Vol. V of the *Journal of Economic Entomology*, contains an exceedingly interesting account of the parasitism of *Laphygma frugiperda* by *Chelonus texanus*, Cress. Apparently this insect has the peculiar habit of ovipositing in the eggs of Laphygma, while the adult parasite emerges from the larva. The adult parasite is approximately half as large as an ordinary house fly, and about as large as a mass of sixty Laphygma eggs. Eggs of Laphygma thus parasitized hatch in a normal manner, but the larva when about half grown prepares a pupal cell supported by a fine-meshed silken cocoon. Two days after the completion of this cell, the larva dies, and on the following day the larva of the parasite emerges from a hole in the centre of the body of the caterpillar. The larva of the parasite then commences to spin its cocoon of white silk within the yellow cocoon of its host, taking several days for the process. A parallel case was observed by the writer [Mr. Bodkin] in the cane fields of Porto Rico early in January of this year. As *Laphygma frugiperda* commonly occurs in British Guiana it is quite possible that this curious parasite is also present.'

THE CONTROL OF FROGHOPPERS.

The Department of Agriculture, Trinidad (June 20) has recently issued an interesting circular (Special Circular No 7) entitled Froghopper Notes by J. C. Kershaw, who is the Entomologist engaged in a study of these insects in that island.

From this circular it appears that the recently discovered 'Vermillion' egg parasite has not been bred in captivity during the dry season in sufficient numbers to give any great amount of encouragement that it can be used under control as a satisfactory means of checking the froghopper during the coming season.

In addition to the use of the green muscardine fungus which has given good results in the past and is being used on a large scale at the present time, it is suggested that there are three other means of combating the froghopper which promise some measure of success. These are outlined herewith, together with certain observations on them.

NITROLIM.

It is suggested that nitrolim (calcium cyanamide) should be used primarily as a manure, and secondarily against the froghopper nymphs. Its effectiveness in this latter connexion has not yet been determined. Nitrolim is an artificial manure of particular interest because it contains a fairly large proportion of nitrogen (18 per cent.) obtained from the atmosphere by an electrical process (see *Agricultural News*, Vol. XI, p.279). Its manurial effect is not equal to that of nitrate of soda, and it is much slower in its action, according to experiments in British Guiana by Professor Harrison and others (see *West Indian Bulletin*, Vol. XIII, p.131), and in Antigua (see Sugar-cane Experiments in the Leeward Islands, 1911-12, p. 85, and Botanic Station Report, Antigua, 1911-12, p.30).

A disadvantage in connexion with the use of nitrolim is to be found in the fact that in the Tropics it rapidly loses a very considerable proportion of its nitrogen in the form of ammonia. Nitrolim kept for nine months in British Guiana lost 60 per cent. of its nitrogen.

KEROSENE-LYSOL EMULSION.

In the preparation of this emulsion 3 oz. lysol and 9 oz. kerosene are stirred into 4 gallons (Imperial) of soft water. This gives a 2-per cent. emulsion which, it is stated, will remain in its emulsified condition indefinitely, that is to say the kerosene and lysol will not separate from the water.

The emulsion kills the froghoppers on coming into contact with them. It is applied from a bottle through the cork of which a short length of glass tube, of $\frac{1}{4}$-inch bore, is passed, the emulsion being shaken from the bottle in a small jet, not a spray, into the axils of the leaves where the adult froghoppers are in the habit of hiding. Used in this manner, this emulsion should be very effective, and at the strength suggested it should not have any injurious effect on the plant.

A certain amount of difficulty is found in getting the emulsion properly applied. Boys are said to do the work better than men but they require constant supervision. The best time for the work to be done is as soon as the adults are to be seen on the canes in any numbers, and if this occurs while the canes are still small, not more than breast high, the results of the treatment will be more satisfactory than if the work is carried out when the canes are taller.

DESTRUCTION OF EGGS.

After each brood of froghoppers, the dry leaves on the growing canes should be examined for eggs, and if these are found in numbers the dry leaves should be removed and thrown into the cattle pens, where the eggs will be destroyed by the trampling of the animals. As an alternative, the trash might be stacked on the bare ground, where, if the eggs hatch, the larvae will not be able to find food.

The removal of the egg-bearing trash should be accomplished as soon as possible after the eggs begin to appear, since these hatch during the wet season in about three weeks after being laid.

PREPARATION OF PLANTATION PARA RUBBER: A REPLY.

In the *Agricultural News*, Vol. XII, Nos. 289 and 290 were published two articles summarizing a recent bulletin on the preparation of plantation rubber, by B. J. Eaton, Chemist to the Department of Agriculture, F.M.S. In this, attention was given, amongst other matters, to the fact that Eaton's results on the maximum quantities of coagulants required for Hevea latex differed markedly from those obtained previously in Ceylon, by Parkin.

In view of this fact, and also because, in general, Eaton's paper appears to deprecate the Ceylon investigations referred to, Parkin has lately published a reply and retrospect on the subject in the *India Rubber Journal* (June 7, 1913).

An account is given first in this article of the conditions under which the Ceylon (1898-99) experiments in question were conducted. At this time, little previous work had been done on Hevea; indeed it was a period when attention was being given mainly to the cultivation of Castilloa under plantation conditions. Wound response had not been scientifically recognized, and consequently, the latex used in the experiments was obtained mainly from initial tappings of Hevea trees, and was thicker and contained a larger percentage of caoutchouc than that procured in ordinary estate practice to-day from successive tappings rendered possible by wound response. Such latex from initial wounds may be more alkaline than that from subsequent tappings, and therefore require more acid for coagulation. A further condition of importance noted is the fact that the laboratory arrangements in Ceylon at that time were limited, though as pointed out, a plea of this kind will not serve to cover the wide discrepancy between Eaton's figures for acetic acid and those of Parkin, even though the figures were originally stated as being only approximately true. Another circumstance which might have affected the results was that Parkin used latex that was kept undiluted. According to Whitby, the development of natural acidity takes place much more rapidly in diluted than in undiluted latex. Lastly, Parkin intimates that his idea of what actually constituted a complete coagulation does not agree with the somewhat loose definition advanced by Eaton.

Coming to the main points of the dispute, they may be grouped under four headings, and discussed in order.

(1) The amount of acetic acid required to bring about complete coagulation.

Eaton found that only about a tenth of the quantity recommended in the Ceylon experiments is required. Parkin's reply is that for reasons already touched upon above, his latex contained less natural acidity.

(2) Is the amount of acid required independent of the dilution of the latex?

In Parkin's experiments, dealing mainly with acetic acid, the conclusion was reached that the amount of acid required depended upon the original quantity of latex present and not upon the dilution. Eaton found otherwise—the more the dilution the more acid is needed per unit volume of original latex Both Crossley's and Whitby's results on the same subject agree with those of Parkin, and evidently the matter demands re-investigation. In concluding his discussion of the point in question, Parkin reproduces some of Eaton's figures to show that they disagree with that investigator's statement, that the greater the dilution the greater is the actual amount of acid that must be added to bring about complete coagulation.

(3) The percentage range or the minimum and maximum of acid for complete coagulation.

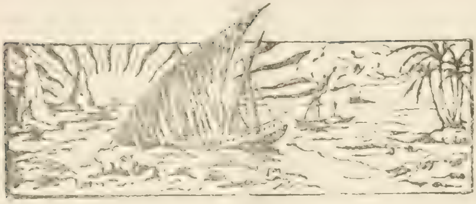
In connexion with this point, Eaton denies that there is a maximum figure for either acetic or other coagulant beyond which coagulation is incomplete, in spite of the fact that Parkin, Crossley and Whitby have shown independently that there is apparently an absolute maximum for acetic acid, while only a relative one for hydrochloric acid and sulphuric acid.

(4) The theory of Hevea latex coagulation.

Under this heading Parkin discusses views on the subject in general. He maintains that the presence of protein is an important factor in coagulation, and likens latex to milk, in that just as the coalescence of the fat globules and the curdling of the protein are distinct, so in latex the segregation of rubber globules and the actual clotting of latex are equally separate transformations.

Without mentioning Eaton's paper, Parkin concludes: 'it may be emphasized that by no means has the last word been said on the coagulation of latex. The subject still awaits complete elucidation.'

Ventilation and Fruit Storage—Since fruits produce carbon dioxide very rapidly, and since they brown and lose their flavour when they are not supplied with oxygen, the need for thorough ventilation during storage becomes apparent. Respiration of ripe fruits as well as that of green fruits is rapid, though fruit tissues that respire as actively in the absence of air as in the presence of air seemed to be those that have finished their growth and are ripe. If growing tissues, such as green peaches, are put in an oxygen-free place for a few days and then brought back into air, the rate of production of carbon dioxide does not entirely return to the normal. This would indicate a permanent injury to the protoplasm or to some of the enzymes due to insufficient oxygen. In this connexion it may be noted that the so-called 'ice scald' injury is due to the same cause, brought about by an accumulation of carbon dioxide within the paper wrappers in which fruit is stored. The question of wrappers for fruits would appear to be a matter worthy of an extended investigation from the standpoint of ventilation. Wrappers allow only a very small air space around each fruit. Some type of perforated or porous wrapper has been suggested as a possible means of combining the desirable qualities of the wrappers with better ventilation tion of the fruit. (From Bulletin 330 of the Agricultural Experiment Station of the College of Agriculture, Cornell University.)



GLEANINGS.

The *Cuba Review* (May 1913) remarks upon the fact that the cost of producing a pound of sugar in Cuba with a modern mill may be as low as 1·25c.

The new St. Lucia lime factory building will be completed about July 5, and it is hoped that the plant will arrive in time to start work in August.

It is stated by the Curator of the Botanic Gardens, Dominica, that the half yearly examination of the agricultural pupils took place towards the end of June.

Cotton stainers continue to cause considerable anxiety in Montserrat. It is likely that an effective parasite has been found, which may help to keep the pest under better control.

According to the *Barbados Advocate*, August 4 will be observed as an arbor day in that island. Applications for young trees may be made to the Superintendent of Agriculture.

A letter has been received from the Secretary of the Ceylon Agricultural Society intimating that the *Tropical Agriculturist* has been purchased by that Society, who are now the sole proprietors.

In connexion with the recent Tuberculosis Conference held at Trinidad, it is a significant fact that the Porto Rico Government has voted $150,000 to build seven tuberculosis hospitals. (From the *Port-of-Spain Gazette*, June 22, 1913.)

The *Voice of St. Lucia* (June 14, 1913) reproduces an article from the *Canada West India Magazine*, which urges the necessity for an increase in the amount of money expended on advertisements by the West Indies.

In Antigua, according to the Curator of the Botanic Gardens, the young cane crop continues to improve; just lately, however, it has been inclined to show the cumulative effect of the rather dry weather experienced in June.

The issue of the *Voice of St. Lucia* for June 21, 1913, contains an article dealing with the parasite known as 'love vine', which has shown a tendency to spread in that island. The article in question suggests methods of control.

Amongst those commodities of the Republic of Hayti, the exports of which have greatly increased during 1912, are: coffee, cacao, logwood roots, lignum vitae and copper. (*Diplomatic and Consular Reports*, No. 5057—Annual Series.)

Amongst the work contemplated at the end of June in St. Vincent was the preparation and forwarding of exhibits on behalf of the Permanent Exhibition Committee to the Canadian National Exhibition that will be held at Toronto during August.

In the Jamaica *Government Gazette* (May 22, 1913) a list is given of the economic and ornamental plants which may be obtained at the price of 1*d.* from the Public Gardens; also a list of free economic plants. The cost of freight is only paid as far as any Jamaica railway station or seaport.

In the *Demerara Daily Chronicle Mail Edition* (June 20, 1913) two long and interesting reviews are given of the recently published Report on Sugar-cane Experiments in the Leeward Islands 1911-12, and of the Report on the Botanic Station and Experiment Plots, Antigua, for the same year.

A table of statistics published in the Dominica *Official Gazette* (June 20, 1913) shows that of those agricultural commodities whose exports have increased the most during the period January 1 to May 31 for the present year as compared with the last, are: cacao, fresh limes, and concentrated lime juice. A reduction is shown in the cases of coffee, firewood cords and hardwood.

The *Gardener's Chronicle* (June 14, 1913), in a short article on West Indian fruits, observes that Indian corn is largely grown in Jamaica, but that that journal is at a loss to understand why the plant should occasionally be classed as a vegetable. This would appear to be another case showing the necessity in Europe of a more wide-spread knowledge of the utilization of tropical produce.

In a letter recently received at this Office from the Administrator, St. Vincent, the interesting facts are referred to that in St. Vincent, during 1911, legislation was enacted providing that all stallions of three years and over, under 14½ hands, shall pay a yearly licence of £3, while stallions of 14½ hands and upwards pay a license of only £1. The result of this legislation has been the castration of all stallions under 14½ hands in height, which has in great part improved the standard of horse flesh in the Colony.

A well-known tropical plant termed *Euphorbia pilulifera* has attracted considerable attention of recent years, on account of its value in the treatment of asthma, bronchitis, and other diseases of the respiratory organs. A recent investigation has led to the isolation of a large number of constituents from this plant, none of which are believed to possess any specific physiological action. Such virtues as the plant has been presumed to possess would therefore not appear to depend upon any single substance of a definite chemical character. (From Publication No. 150 of the Wellcome Research Laboratory.)

STUDENTS' CORNER.

JULY.

SECOND PERIOD.

Seasonal Notes.

There are several circumstances at the present time which render it convenient for the student to direct his attention to the question of judging animals by means of scale points. The action for instance, which is being taken in the Leeward Islands, and has already been followed in Trinidad and elsewhere, to put a stop to the adulteration of milk will have an indirect effect in that it will make it very worth while for stock-owners to breed from selected animals and obtain a maximum yield under the state of fair competition brought about, and another circumstance is that at this time of year, with the wet weather setting in and the consequent flush of green fodder, the animals are likely to be in good condition for a critical inspection.

With a view to encouraging selection of dairy cows the following scale of points is reproduced from *The Agricultural Note-Book* (1910 edition), by Primrose McConnell, B.Sc.

SCALE OF POINTS FOR JUDGING A COW.

	GENERAL APPEARANCE.	PERFECT SCORE.
1.	Weight — — — — — —	
2.	Form: Inclined to be wedge-shaped — —	6
3.	Quality: Hair fine, soft; skin mellow loose, medium thickness, secretion yellow; bone clean, fine —	6
4.	Condition: Lean, though vigorous appearance when in milk — — — — —	6
	HEAD AND NECK.	
5.	Muzzle: Clean cut; mouth large; nostrils large —	1
6.	Eyes: Large, bright, full, mild — — —	1
7.	Face: Lean, long, quiet expression — —	1
8.	Forehead: Broad — — — —	1
9.	Ears: Medium size, yellow inside, fine texture —	1
10.	Horns: Fine; texture wavy — — —	1
11.	Neck: Fine, medium length; throat clean; light dewlap — — — — —	1
	FOREQUARTERS.	
12.	Withers: Lean, thin — — — —	1
13.	Shoulders: Light, oblique — — —	2
14.	Legs: Straight, short; flank fine — —	2
	BODY.	
15.	Chest: Deep, low; girth large with full foreflank	10
16.	Barrel: Ribs broad, long, wide apart; large stomach — — — — —	10
17.	Back: Lean, straight, open-jointed — —	2
18.	Loin: Broad — — — — —	2
19.	Navel. Large — — — — —	2
	HINDQUARTERS.	
20.	Hips: Far apart, level — — — —	2
21.	Rump: Long, wide — — — —	2
22.	Pin Bones or Thurls: High, wide apart — —	1
23.	Tail: Long, slim; fine hair in switch — —	1
24.	Thighs: Thin, long — — — —	4
25.	Escutcheon: Spreading over thighs, extending high and wide; large thigh ovals — — —	2
26.	Udder: Long, attached high and full behind, extending far in front and full, flexible; quarters even and free from fleshiness — — —	20
27.	Teats: Large, evenly placed — — —	5
28.	Mammary vein: Large long, tortuous, branched with double extension; large and numerous milk wells — — — — — —	5
29.	Legs: Straight, short; flank fine — — —	2
	Total	100

The judging of different cows of known milk capacities by means of the above table, particularly if carried out in conjunction with other students will be found both instructive and interesting.

Note the great relative importance of the chest, barrel and particularly the udder points in judging milch cows

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What are the three essential conditions for germination? What methods have been tried for accelerating the rate of germination?

(2) Of what use is carbon dioxide, (a) in the soil (b) in the air?

INTERMEDIATE QUESTIONS.

(1) Describe the process of kiln-drying of grain.

(2) How would you proceed to calculate the number of feed units in a ton of Indian corn? [Corn contains: protein* 8·4 per cent.; fats,* 4·8 per cent.; carbohydrates* 57·8 per cent.]

FINAL QUESTIONS.

(1) Prepare a statement showing the cost, in your district, of producing an acre of sugar-cane.

(2) Write a short essay (of about 400 words) on the coagulation of latex, introducing the most recent views on the subject.

Colonial Agricultural College at Tunis.— A short account of the agricultural college at Tunis is given in the *Monthly Bulletin of Agricultural Intelligence and of Plant Diseases* (March 1913) and some of the information presented is likely to prove of interest in the West Indies in view of the attention which is now being given to the question of tropical agricultural colleges.

The Tunis college was founded in 1898 and since then it has been attended by upwards of 300 students; of these ninety-seven are engaged in farming in Tunis, and thirty-two in Algeria; twenty, who have remained in the colony, have taken up professions which are only indirectly connected with agriculture; 103 have returned to France and are occupied in farming; the remainder are in various parts of the French tropical possessions.

As regards the institution itself, numerous experiments have been conducted there in regard to the use of new implements, the application of manures, cotton trials, and irrigation work. Briefly expressed, the institution appears to be mainly a college for the teaching of dry farming, and consequently irrigation and various other branches of civil engineering form important lines of study.

From the article under consideration most of the instruction would appear to be largely of a practical nature though apparently the theoretical side is not neglected. At any rate the large number of students who have taken up agricultural employment would indicate that the institution at least serves a useful purpose.

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* Digestible.

FUNGUS NOTES.

A NEW DISEASE OF THE CASTOR PLANT.

An interesting account of a new disease of the castor oil plant (*Ricinus communis*, L.) is contained in the *Memoirs of the Department of Agriculture* in India, Vol. V, No. 4. The paper in question deals almost entirely with the morphological and cultural characters and parasitism of the causal fungus, but such of the information as is thought likely to be of interest to the general reader has been summarized in the following article.

USES OF THE CASTOR OIL PLANT.

The author (J. F. Dastur, B.Sc.), who is first assistant to the Imperial Mycologist, begins with a discussion of the economic importance of the castor oil plant. It is observed that oil from the seed is in great demand commercially owing to its value in the manufacture of Turkey red, and because of its medicinal properties. Castor oil is also used for illumination purposes and as a lubricant; it is employed for dressing tanned hides and skins; castor oil cake is an important constituent of manures; whilst finally, the plant itself is cultivated in Assam, for feeding the eri-silkworm on its leaves. Incidentally it may be mentioned that a beginning has been made with a view to growing the plant for this latter purpose in the West Indies.

FUNGUS DISEASES OF THE PLANT.

The castor oil plant is, on the whole, remarkably free from pests and diseases. The most widely distributed perhaps is the leaf rust. In India, an Alternaria and a Cercospora have been found on the leaves and are at present under investigation; but the most important disease in India, and one which has for years caused considerable damage is that induced by *Phytophthora parasitica*, nov. spec.

PHYTOPHTHORA AND WEATHER CONDITIONS.

A characteristic feature attendant on the outbreak of this disease is the fact that it has been found appearing every year, at Pusa, about the end of June, after the rains have set in. In 1912, it appeared as early as June on account of the frequent showers received during April and May. The disease disappears by the beginning of September, at the end of the rains. It is therefore largely controlled by weather conditions.

APPEARANCE OF DISEASED TISSUE.

The fungus in question both destroys seedlings and attacks leaves of older plants. The first indication of the disease is the appearance of a roundish patch of an unhealthy dull green colour on both the surfaces of a cotelydon. The disease spreads from the leaf to the petiole, thence to the stem and growing point, killing the seedling. In older plants the disease in the field is localized on the leaf blade. As the diseased spot gets older, it turns yellowish and then brown. On the under surface of the leaf, in a more or less advanced stage, there may be seen by the aid of a lens a sparse white web of threads originating from the unhealthy green-coloured portion of the diseased spot. These are the long and unbranched fruit stalks of the fungus, measuring from about 100 to 300 microns in length. The mycelium within the tissues is both intracellular and intercellular. Wherever an intracellular hypha passes through a wall there is invariably a constriction of the hypha. Haustoria are very scarce. When a diseased petiole or stem is cut transversely, the ring of fibro-vascular bundles becomes prominent by its black or brown colour on account of the fungus in the vessel. Internal sporangia have often been observed in the tissues of leaves, stems and fruits. Sexually produced spores (oospores) were not found in nature, but as will be mentioned later, were readily detected in pure culture.

ARTIFICIAL INFECTION WITH SWARM-SPORES.

In the investigation under consideration a large number of experiments were carried out to discover to what extent the fungus is an active parasite. Before pure cultural inoculations were made, either a portion of a diseased leaf was placed under moist conditions on a healthy plant, or spores were obtained from a diseased portion, grown in a petri dish and the swarm-spores placed on healthy leaves. When the fungus was taken in culture, swarm-spores (zoospores), suspended either in distilled water or in sterilized tap water, were invariably used for the various inoculations. The effect of inoculation was clearly perceptible within twenty-four hours by the inoculated area taking a dull unhealthy green colour. Sporangia were produced in about forty-eight hours after inoculation, when the inoculated leaf was kept moist by occasionally spraying it with water.

FACTS CONCERNING PENETRATION.

From the infection experiments it was found that the germ tubes of the zoospores penetrate the leaf three to five hours after they are sown on it. The penetration takes place on either of the surfaces and is not accomplished necessarily through a stoma. They may even break through the upper wall of the epidermal cells or penetrate between the cell walls of two neighbouring cells. An interesting matter in connexion with these inoculation experiments was the employment of Klebahn's method when that of putting a drop of water containing freshly discharged zoospores, failed.

KLEBAHN'S METHOD.

In Klebahn's method the stems of young plants are surrounded by a jacket of distilled water, containing motile zoospores in a glass tube about 4 inches long and ¾-inch broad, the lower end of which is plugged by a rubber cork cut into two equal halves and having a central board just big enough to enable the two halves to surround the stem in a water-tight manner without injuring it. The lower end is waxed; the upper end is kept open. Successful inoculations were obtained by this method without any wound being made, and the young plants wilted in four days. Plants three to six months old, however, remained quite healthy, owing mainly to the resistance offered by the cuticularized epidermis (hardened skin).

ARTIFICIAL INFECTION OF FLOWERS AND FRUIT.

A most interesting feature of this work was the discovery of the fact that castor oil flowers—particularly the male flowers—take the inoculation in a day, turning brown and then black. The fungus also causes the fruit to rot. Inoculations on dried fruit invariably fail. Though in the laboratory, fruits and flowers are so virulently attacked, in nature they have been found to be entirely immune. The cause of this is attributed solely to the climatic conditions prevalent at the time of fruiting under ordinary field conditions. In other words, the fungus cannot make headway in dry weather.

VITALITY OF PARASITE IN THE SOIL.

The final set of experiments in regard to inoculations concerned the question as to whether the disease can be distributed in the soil. It was found that the fungus in the soil is not able to retain its vitality for two months—a most important result, since it shows that an outbreak can be checked by growing in rotation another, even a short-lived crop like a green dressing. It was also discovered that, in regard to seedlings which were attacked by the fungus in the soil, the point of infection was always confined to the surface level of the earth. In the field, infection has never been found at the surface level but always above it.

A further account of the fungus will be given in the next issue of the *Agricultural News.*

AGRICULTURAL AFFAIRS IN ST. KITTS.

The following interesting account of agricultural matters in St. Kitts is taken from a report on a visit to that Presidency last May, recently forwarded by Mr. Tempany, B.Sc., F.I.C., Superintendent of Agriculture for the Leeward Islands.

The primary object of the visit was in connexion with the reaping of the experiments with varieties of sugar-cane conducted in the Presidency, and with this the largest share of Mr. Tempany's time was occupied. Three hundred and eighty-five experimental plots were successfully reaped in the field, samples of the cane crushed, the juices analysed, and the results calculated and entered up. The results may be regarded as satisfactory, and as constituting, to some extent, a record, the percentage of experiments successfully reaped being higher than on any previous occasion.

In passing, comment is made on the remarkably good yields experienced in the field, the result forming striking evidence of the recuperative powers of the soils of St. Kitts, in view of the exceptionally unfavourable weather met with up to the end of last August.

Considerable interest existed in St. Kitts (as in Antigua) on the question of syrup manufacture in preference to sugar, on muscovado estates. (See *Agricultural News*, Vol. XII, p. 179.) As prices ranged at that time, the former practice offered considerable advantages. A well attended meeting of planters was held in St. Kitts, and Mr. Tempany delivered an address on syrup-making, in which considerable interest was evinced. A number of planters also consulted Mr. Tempany personally on the subject, and visits were paid to several estates in the same connexion. Arrangements were made for the examination of samples at the laboratory, on payment of a small fee; in this way sixteen samples were examined. On the whole, the quality of the syrups submitted was decidedly good.

At the request of His Honour the Administrator, arrangements were made for an examination of the milk-supply of the town of Basseterre, during the visit, and in all, twenty-seven samples were examined. A separate report on this work is to be submitted to the Government.

Samples of megass—fifteen—were also analysed in connexion with an enquiry into the composition of different cane varieties grown under varying conditions of soil and rainfall. Some measurements were also made in regard to the temperatures of the soil at varying depths, on the experiment plots.

Seven visits were paid to estates, partly in connexion with the reaping of the cane experiments, and partly on other accounts. Among these a special one was paid to the cacao plantation at Molineux estate, with reference to the dying out of trees in certain places. This problem will be dealt with in detail in due course.

Further visits were paid to the Central Factory, and the work discussed with the manager and the chemist in charge. The quality of the sugar-making done during the present season is stated to be high. Special interest attaches to the trial of oil fuel in the furnaces, the arrangements for which are now completed.

Opportunity was taken to discuss various points with the Agricultural Superintendent, St. Kitts, with reference to the agricultural work in the Presidency. In this connexion mention may be made of the arrangements completed for the distribution of Paris green among the peasant cotton growers of Nevis, which should successfully avert a repetition of the events of the previous season.

After consultation with His Honour the Administrator, samples of water were drawn by Mr. Tempany from the Basseterre town reservoir for examination in the laboratory in Antigua, samples will subsequently also be submitted from the various country sources of supply, and the results reported on in due course.

RUBBER-PLANTING ON HILLSIDES.

The following article, which appeared in a recent number of the *Agricultural Bulletin of the Federated Malay States* (April 1913) has been reproduced, in the hope that the method it outlines may prove useful to planters, and others, in islands like Dominica, where, in some places, rubber is being planted under conditions similar to those referred to below.

In planting Para rubber on the side of hills where the gradients are severe, I believe it would prove of great advantage to adopt the same method as that practised in Penang with nutmegs and cloves on similar situations.

The system is simple enough. As soon as the young plants or stumps have been put out, a circle of about 3 feet in diameter is made round them and the earth taken from the upper half of this to the lower so as to form the circle into a terrace. At each weeding after this, more earth should be taken from above the plant and the circle enlarged and weeded. If this be done constantly as the coolies come round at the regular weeding periods, it will be found that by the time the trees have reached maturity, these circles practically form a series of terraces on the sides of the hills, according to the distances the trees are apart.

It will be noticed that the plants are all along being fed with the rich surface soil which alone should assist their growth, and for the same reason the circles or terraces round the trees are easily weeded and kept clean, as the top surface soil remains loose and friable for a considerable time. Apart from the entire eradication of lalang, no other weeding on the clearing is required, and the timber and grass will prevent heavy wash and quite do away with the necessity of drainage; of course the timber and stumps should ultimately all be removed and destroyed. The next benefit derived is when the tapping stage commences: for instead of the tappers having the difficulty of climbing slopes in an irregular way, they each take a circle or circles as the case may be, the walking being practically all on the level, and under these conditions the coolies should be able to tap the same, or if not very nearly the same number of trees as on the flat.

Considering the saving of expense that can be effected in the directions I have mentioned, the system should not be unduly costly, and I think, on the other hand, it must be admitted it has many advantages over the method now usually adopted. I may in conclusion mention that this method of cultivation must be commenced while the plants are quite young, otherwise taking the earth from above the trees when once thoroughly established, would mean the lateral roots being interfered with and exposed.

MARKET REPORTS.

London.—The West India Committee Circular, July 1, 1913; Messrs. E. A. de Pass & Co., June 20, 1913.

Arrowroot—4⅞*d.*
Balata—Sheet, 2/10; block, 2/1 per ℔.
Beeswax—£8 5*s.*
Cacao—Trinidad, 66/- to 75/- per cwt.; Grenada, 65/- to 73/-; Jamaica, 62/6 to 72/-.
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Rum—Jamaica, 2/4 to 6/- per gallon.

New York.—Messrs. Gillespie Bros. & Co., June 27, 1913.

Cacao—Caracas, 14½c. to 15c.; Grenada, 14¼c. to 14½c; Trinidad, 14¼c. to 14¾c.; Jamaica, 12½c. to 14c.
Coco-nuts—Trinidad and Jamaica, selects, $34·00 to $36·00; culls, $20·00 to $21·00 per M.
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Oranges—Jamaica, $3·00 to $4·50 per box.
Pimento—5c. per ℔.
Sugar—Centrifugals, 96°, 3·30c. to 3·33c. per ℔.; Muscovados, 89°, 2·80c. to 2·83c.; Molasses, 89°, 2·55 to 2·58c. per ℔., all duty paid.

Trinidad,—Messrs. Gordon, Grant & Co., July 7, 1913.

Cacao—Venezuelan, $14·60 to $14·75 per fanega; Trinidad, no quotations.
Coco-nut Oil—$1·13 per Imperial gallon.
Coffee—Venezuelan, 15½c. per ℔.
Copra—$4·85 per 100 ℔.
Dhal—$4·50 to $4·55
Onions—$1·75c. to $2·00 per 100 ℔.
Peas, Split—$6·20 to $6·25 per bag.
Potatoes—English, $2·00 to $2·50 per 100 ℔.
Rice—Yellow, $5·30 to $5·40; White, $5·50 to $5·60 per bag.
Sugar—American crushed, no quotations.

Barbados,—Messrs. James A. Lynch & Co., Ltd., July 12, 1913; Messrs. T. S. Garraway & Co., July 5, 1913; Messrs. Leacock & Co., July 4, 1913.

Arrowroot—$6·00 to $7·00 per 100 ℔.
Cacao—$14·00 per 100 ℔.
Coco-nuts—$18·00
Hay—$1·50 per 100 ℔.
Manures—Nitrate of soda, $70·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $82·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$2·00 to $3·00 per 100 ℔.
Peas, Split—$5·50 to $6·00 per bag of 210 ℔.; Canada, $3·85 to $4·00 per bag of 120 ℔.
Potatoes—Nova Scotia, $2·50 to $4·50 per 160 ℔.
Rice—Ballam, $5·05 to $5·40 per 190 ℔.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $3·75 per 100 ℔.

British Guiana.—Messrs. Wieting & Richter, July 5, 1913; Messrs. Sandbach, Parker & Co., July 4, 1913.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	8c. per ℔.	—
Balata—Venezuela block	No quotation	—
Demerara sheet	65c. per ℔.	—
Cacao—Native	15c. to 16c. per ℔.	13c. per ℔.
Cassava—	60c.	—
Cassava Starch—	$5·00 to $6·00	—
Coco-nuts—	$16 to $20 per M.	$10 to $16 per M.
Coffee—Creole	16c. per ℔.	18c. per ℔.
Jamaica and Rio	16c. per ℔.	18c. per ℔.
Liberian	13½c. per ℔.	14c. per ℔.
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Green Dhal	$5·50	—
Eddoes—	$1·32	—
Molasses—Yellow	None	—
Onions—Teneriffe	3½c. to 4c.	4c. to 4½c.
Madeira	5c.	5½c.
Peas—Split	$6·25 per bag (210 ℔.)	$7·50 per bag (210 ℔.)
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Motor Cultivation.

WITHOUT any pretence at an exhaustive treatment of the subject, an attempt has been made in this article to review in a general manner, the present state of motor cultivation in different parts of the world. One favourable opportunity for doing so is presented through the recent publication of a comprehensive account, by Dr Fischer,[1] of the position of this phase of agricultural engineering in Germany.

From the account given by this writer it would appear that after many years' laborious and expensive experiments, the difficulties surrounding the employment of oil engines for automatic ploughs[2] were first satisfactorily overcome in 1910 by Robert Stock.* The motor-plough invented by this engineer has survived the test of time, and there are now several hundred already in use on small German farms. As regards the work done, and the consumption of fuel by this machine, it may prove of interest to record the following results which were obtained during recent trials conducted by the Colonial Committee, Berlin: 'On a mild sandy loam the motor-plough worked nearly 1·73 acres in one hour to a depth of 6½ inches. The field was 700 yards long, and of a convenient shape. Another day, 1·48 acres per hour were ploughed to a depth af 8¾ inches. Lastly, in consequence of several stoppages due to the field not being sufficiently dry, only 0·99 acre was ploughed per hour to a depth of 7¼ inches. The consumption of benzine was, under the favourable conditions of the first day, only 12·3 lb. per acre, but on an average, in practice, it ranges from 14·3 to 19·6 lb. per acre. The power developed, as registered by a break dynamometer, was 33·9 h.p.

The technical success of the machine just discussed gave stimulus to other inventors to create improvements, particularly as regards change of gear and reversing. The former operation is important in connexion with the cultivation of undulating land; reversing is still more essential, for if an unreversible machine happens to be brought up against a large stone or any other such obstacle, the mortifying and expensive procedure of invoking the aid of horses to shift it becomes absolutely necessary.

Several new machines of the Stock type eventually appeared on the German market, but very few have survived. In a recent publication[3], reference is made to a motor-plough of the Stock type, the wheels of which are equipped with shovel points (to prevent slipping) which can be thrown flat against the rim when travelling over hard road. This would appear to be a feature of some practical importance.

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*Stock's plough is described in this issue on page 255.

Of late, manufacturers seem to have turned their attention rather to the construction of disc motor-ploughs. Pöhl's patent motor-plough, for instance, carries in front of every ploughshare a revolving coulter for diminishing resistance. This feature makes Pöhl's plough resemble, somewhat, those machines which till the soil not by means of ploughshares, but by revolving hoes. In such machines, the driver sits in front of the three-wheeled vehicle which, in the distance, is said not to be at all unlike an ordinary automobile.

As regards the efficiency of disc motor-ploughs, little data is available for pronouncing a final judgment. Experience shows they require more power to work them than ordinary motor-ploughs. On the other hand, their work is more intense, since the discs produce a fine tilth during a single operation. Another advantage which they offer is the fact that the discs work in the same direction as the driving wheels, and although they may not actually propel, they do not act as brakes, as ploughshares do. One disadvantage of the disc is that it is liable to cut up and distribute couch grass, and other perennial weeds.

In considering motor cultivation, the distinction between the self-contained implements just discussed, and the American tractor machine must always be borne in mind. These tractors haul other implements besides ploughs. In the case of the ploughs, an advantage is gained under this system in that the shares are independent and yielding; also disc-ploughs can be substituted—a convenient matter, when, for instance, ease of penetration and a sort of cutting effect is desired, as in turning under long pen manure or green dressings.

Tractors, at present, are employed in practice more extensively than the self-contained machine. In the western United States they are fairly commonly used, and are likely to become still more general. P. S. Rose[4] has lately collected data from thirty-six agricultural colleges in the United States to show that a somewhat deeper ploughing is needed there to obtain the best crop yields. To double a 4 to 8 inch depth of ploughing, at least 50 per cent. more work animals would be required, and it is believed that this shows the economic necessity of mechanical power for deep cultivation.

Quite recently, in Louisiana, the employment of tractors on sugar estates has been advocated.[5] Figures have been given to show that, with a six-mule team and a four-mule team, ploughing costs $8 and $4 per acre, respectively; and since tractor engines will do from 10 to 20 acres a day as against one acre by animal power, it is argued that, provided the land surface is suitable and there is sufficient work to be done, implemental tillage ought to be very much more economical.

It is maintained that, in Louisiana, more might be obtained from the land if a three years' rotation were instituted, namely, two crops of cane and one of corn and peas. Under such a rotation every acre on the estate would have to be ploughed each year. To do this by mule labour would be prohibitive, but practicable with tractor power. The present position of the Louisiana sugar industry, although not referred to in the article in question, would seem to provide a further argument of an external economic nature in favour of the introduction of another staple crop into the cultivations of that State. It may be pointed out in passing, that the employment of tractor power necessitates the filling up of cross ditches—a matter of some moment in regard to Louisiana.

Not only from North, but also from South America have favourable statements emanated concerning tractor ploughs. A recent publication[6] describes a trial made some few months ago in Peru, with a large 60 h.p. tractor costing with all accessories £2,000. It ploughed, under favourable circumstances, 3·57 acres at a depth of 15 inches in sixty minutes, with a consumption of one tin* of paraffin. In Hawaii, according to another journal[7], motor traction engines and motor-ploughs have been finding a place on some of the cane plantations. The one which has incurred most favour in Hawaii is the Caterpillar tractor. The opinion of one manager is that a 60 h.p. tractor will plough 8 acres a day to a depth of 6 inches at a cost of $1·50 per acre. The machine will harrow 30 to 40 acres a day.

Perhaps the most thorough trials of tractors and motor-ploughs were those conducted under the auspices of the Royal Agricultural Society of England[8] in 1910. In these trials, the best all-round efficiency was obtained from a 25 to 30 h.p. compound steam-tractor weighing 5 tons. The oil-engine machines were not so successful. It has to be remembered, however, that considerable improvements have been effected since the time of these experiments.

From the point of view of the investor, the most intimidating feature of motor cultivation is the question of depreciation. For tractors, it is estimated that at least 10 per cent. must be allowed for wear and tear. Motor-ploughs are still too recent to permit of their durability being definitely determined. Dr. Fischer states: 'It is usual to calculate for interest, amortizement and repairs, 25 per cent. of the purchase price which amounts for Stock's and similar ploughs to about £830, for the large Ihace ploughs £1,130, and for the smaller ones £735.' Such figures have to be reckoned with, even with competent drivers, because the machines have to work under unfavourable conditions, and the quick-running engines (720 revolutions per minute) soon wear out. It must be remembered, too, that, apart from wear and tear, the constant introduction of new types lowers at least the selling-price of the less up-to-date machines already in use.

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*Presumably 5 gallons.

As a fitting conclusion to this review, reference may be made briefly to the employment of motor cultivation in the West Indies. For some years, in British Guiana, Trinidad and in Antigua, steam power has been employed for ploughing purposes, but of late, oil locomotives have been introduced into Demerara in connexion with rice cultivation. The possibility of their employment in Antigua has been brought to the notice of planters[9], but in that island haulage of implements by stationary engines seems best suited to the soil conditions obtaining in that Presidency.

In any consideration of the employment of motor cultivation, it must always be remembered that although efficient machines exist, both in the form of tractors and self-contained implements, their economic employment depends upon two outstanding factors: labour conditions and soil conditions. That circumstances may actually demand their introduction into some of these islands is made evident by the recent decision of the Government of St. Croix[10] to vote 30,000 francs for the purchase of a motor-plough with accessories, which will be at the service of planters. The Government has furthermore authorized the employment of an engineer, and the expenditure of a sum not exceeding 500 francs monthly, to defray the expenses connected with the working of the machine.

The figures in the following table have been derived from the references quoted. The table is intended to serve purposes of general comparison, and to give an idea as to what the motor-plough and tractor can do; but too much importance must not be attached to the figures individually.

Trials.	No. of acres ploughed pr. day of 8 hrs	Depth of ploughing in inches.	H. P.	Fuel per acre.
Germany[1] (motor-plough)	14	6·5	33·9	13 lb.
England[2] (motor-plough)	1·5	6	4	2 gals
Peru[6] (tractor)	28·5	15	60	1·4 ,,
Hawaii[7] (tractor)	8	6	60	—
England[8] (tractor)	5	5	18	3·7 ,,
Australia[3] (tractor)	23	3·5	30	1·5 ,,

Price of machines (approx.): Germany (motor-plough), £850; Peru (tractor), £2,000 England (tractor), £275.

SUGAR INDUSTRY.

THE DATE SUGAR INDUSTRY IN BENGAL.

In Bengal, the date palm is planted at the rate of some 350 trees to the acre, preferably in light soils in humid localities. The trees take some five or six years to come into bearing.

In a valuable paper in the *Memoirs of the Department of Agriculture in India*, Vol. II, No. 6, it is stated that one hundred and seventy pounds of juice per tree per annum is regarded as a fair average yield throughout the date sugar district, and, at a conservative estimate, the profit is 3½ annas (about 5*d.*) per tree. The date palm yields its juice in the cold season. The writer makes the important suggestion that the Palmyra Palm (*Borassus flabelliformis*), which yields its juice in the hot season, might be planted with the date palm, in order to produce a regular supply. This would render practicable the establishment of central factories in place of the crude and wasteful native arrangements for manufacture and refining.

The feature of the industry which requires improvement most is the operation of tapping. The date palm is not punctured as is the maple tree, but is systematically pared, and the proper flow of juice appears to depend upon a kind of wound response. A number of different factors affect the yields, but the chief point is that the juice necessarily remains in contact with the air for a considerable time and great losses occur through fermentation. Annett (the writer of the paper) found that sponging the wounds with dilute formaldehyde solution greatly retarded inversion—much more so than the native smoke method does.

As regards manufacture, the average loss of sucrose on boiling worked out at 12·5 per cent. and of total sugar 12·2 per cent. This could be reduced by the adoption of cleanly methods in the native factories.

In connexion with the purely chemical aspects of date sugar, the following facts should be of interest. In comparing date palm juice with that from the Red Mauritius sugar-cane, it was found that a sample of the former contained sucrose, 11·61 per cent., reducing sugar, 0·83 per cent. A sample of the cane juice gave: sucrose 18·80 per cent, reducing sugar 0·26 per cent.

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[1] *Monthly Bulletin of Agricultural Intelligence and of Plant Diseases* (June 1913).

[2] *Agricultural News*, Vol. XI, p. 408.

[3] *Experiment Station Record*, Vol. XXVII, No. 7, p. 685.

[4] *Experiment Station Record*, Vol. XXVIII, No. 9, p. 892.

[5] *Louisiana Planter* (June 21, 1913).

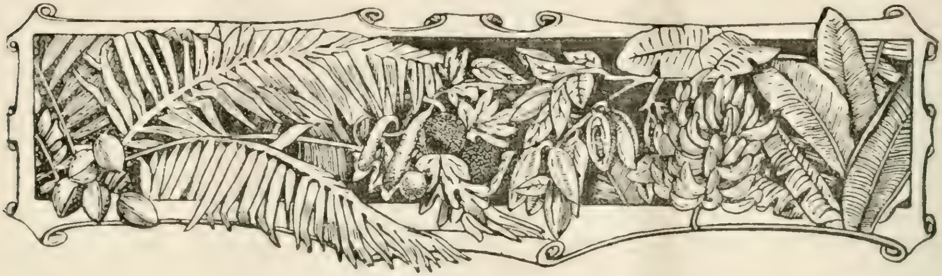
[6] *Peru Today* (May 1913).

[7] *Australian Sugar Journal* (May 8, 1913).

[8] *Journal of the Royal Agricultural Society of England*, Vol. 71, p. 179.

[9] *Agricultural News*, Vol. X, p. 159.

[10] St. Croix *Avis* (June 25, 1913)



FRUITS AND FRUIT TREES.

CACAO PRIZE-HOLDINGS COMPETITION, DOMINICA.

The report on the above competition held in the Grand Bay District during 1912-13 has just been received, through the Curator of the Botanic Gardens, Dominica, from Mr. G A. Jones, Assistant Curator. The chief points of interest are summarized in the following article.

The competition which the report describes was originally inaugurated by the Imperial Department of Agriculture with the object of improving the methods of cacao cultivation amongst the peasant proprietors of the different districts. As on previous occasions (see *Agricultural News*, Vol. XI, p. 132) there were two classes of holdings: Class I, for holdings not over 4 acres and not less than 1 acre of cacao in bearing; Class II. for holdings under 1 acre having not less than 100 trees of cacao in bearing calculated at a reasonable distance apart.

All the holdings were visited three times during the year by the Local Instructor (Mr. J. O. Henderson) and the Assistant Curator of the Botanic Gardens (Mr. G. A. Jones). Work that should be done was indicated, trees and brances which were useless were marked out, and in several cases, where drains were required, the Instructors lined out the course. The peasants were shown the proper methods for removing pods from trees and they were told of the danger of allowing husks to lie about the plots. The need for manuring and wind-breaks, and for the removal of the lower branches of shade trees was also carefully pointed out. The majority of the competitors seemed willing to take advice with the exception of that concerning the removal of trees. The institution, however, of an experimental plot, by the Instructors, with the object of proving that a maximum crop does not follow when the trees are overcrowded, had a useful effect in causing several of the competitors to believe in, and carry out the operation of thinning cacao plots.

As regards the award of prizes, the first in Class I was divided between two competitors, and in the second Class, owing to lack of merit, the first prize was not awarded. On the whole, the general standard was very satisfactory.

A most encouraging feature of the competition was the circumstance that the former prize winners, although ineligible for re-competition, spare no effort in keeping their plots in excellent order and up to the standard which they had attained in the competition of the former year. Indeed the stage has been reached in the Grand Bay District and in La Plaine as well, when it is not necessary again to offer money prizes. In the opinion of the Assistant Curator, if annual visits are paid by an Agricultural Officer it will be quite sufficient for keeping the people, whether former competitors or not, on sound agricultural lines.

Cheap and Satisfactory Way of Shipping Bananas.—Interesting particulars concerning the banana exports to Europe from the Canary Islands are presented in *Diplomatic and Consular Reports*, No. 5073—Annual Series. The total trade showed a slight increase on that of the previous year. The amount of fruit sent to France underwent a large increase, but to all other continental countries very little difference was noted. During 1912, however, Germany received 20,000 crates less, whilst the United Kingdom's imports showed an increase of 60,000 crates. An increase of nearly 5*d.* per crate in the freightage on bananas shipped from the Canaries has inflicted a heavy loss upon shippers, and the position became so difficult that some of the most important houses started a line of steamers to carry their own fruit. One principal house tried to get over the difficulty by employing a *papier maché* covering for the fruit instead of wooden crates. This reduced the space considerably. The experiment, it is said, has given most satisfactory results, both as regards the condition of the bunches on their arrival at their destination, and as regards the cost of packing, on which a great saving has been effected by the new method.

Exhibits for the Bristol and Toronto Exhibitions.—A letter has been received from the Secretary of the Agricultural and Commercial Society of Grenada to the effect that a large selection of interesting exhibits are being forwarded through the Imperial Department of Agriculture to Toronto. These include, amongst other articles, different specimens of cacao, coco-nut, spices and fruit products. A communication from the Agricultural Superintendent, St. Kitts-Nevis, also contains satisfactory information in regard to the representation of these islands at the Toronto Exhibition. It is stated that the exhibits, ninety-six in number, consist of sugars and by-products, cotton and by-products and various kinds of preserves. According to the *Dominica Official Gazette* (July 4, 1913) full advantage has been taken for advertising in England at the Bristol Show, Dominica limes and citrus fruits in general. A list of the exhibits is published in the Gazette referred to.

AGRICULTURAL COLLEGES FOR THE TROPICS.

RECENT MEETING IN LONDON.

An account, in proof form, of a recent meeting at the residence of Sir Robert Perks, has been received at this office through the courtesy of the Editor of *Tropical Life*. The gathering, which was an influential one, had for its objects the discussion of: (1) the necessity for establishing agricultural colleges in the Tropics; (2) why it was necessary to have at least two colleges, one in the East (perhaps Ceylon) and one in the West (probably at Trinidad); (3) the scope and possibilities of such colleges when established.

The feature of the evening was Mr. Norman Lamont's speech, which is reproduced below. It will be observed that in regard to the scope of the proposed institutions, Mr. Lamont's remarks are in agreement with predictive statements on this point, made previously in the current volume of the *Agricultural News* on pp. 198 and 216.

After referring to the suggested institution by Lord Reay's Committee of Readerships in Tropical Agriculture in England, and to the more recent proposal of Agricultural Colleges in the Tropics,

Mr. Lamont said:—

This latter proposal is not a new one, but its importance has only become recognized in the last few years. . . . In the Colonies, themselves, it is creating not only interest but enthusiasm, as we may see from their newspapers, and from the debates and discussions in their Agricultural Societies.

Why is there this increasing interest in the question? It has long been recognized in temperate climes that skill and science are more and more necessary in agriculture; but the rich virgin soils of the Tropics, their perpetual summer, and their cheap labour, have enabled their crops to be grown so easily, and harvested so profitably, that the idea became prevalent that skill and science were altogether superfluous. But now that soils are getting tired, if not exhausted, that prices are falling, that substitutes are being invented, and that vast new areas are being rendered available for cultivation by railway extension, and other improvements in means of communication, it is seen that science is imperative, that only the most highly-skilled and trained men must be employed, that the last ounce of produce must be extracted from the soil, if cultivation is to continue profitable.

In the sugar-industry this has, for some time, been obvious. In the rubber-industry it has recently been brought home to a host of new and puzzled Directors, themselves not precisely experts in tropical agriculture, by the very great difficulty of obtaining trained men as managers, and assistants, on their plantations. . . . . .

But the establishment of this College is needed not only for the maintenance of the sordid, necessary dividend, but for the advance of knowledge. It would be of great assistance to Universities here; for a Tropical Research Station would re-act very favourably on research work at home, and most valuable new facilities would be afforded to post-graduate workers, especially in the three important subjects of Botany, Entomology, and Mycology. Furthermore, the interchange of teachers and students would certainly stimulate ideas.

Again, new careers are opening out in these three subjects for experts, specialists, advisers, inspectors, and instructors under the Departments of Agriculture which are being established, or enlargened, by all our tropical Colonies. At present, the young men of the better class in those Colonies seek their fortunes far too largely in the two professions of Law and Medicine. Our Institution would give them a new chance of shaping a career interesting and remunerative, and at the same time full of work important to the future of their native land.

So much for the need for the College; now a few words as to its scope. This question of scope has been so thoroughly argued in a brilliant article in *Nature*, over the well-known initials J.B.F., that the discussion on this point may be regarded as closed. The institution must be an Agricultural College of University rank. A full-blown University would be too costly, too ambitious. Some of its departments would certainly be starved, and its general prestige lowered in consequence. Besides, needs, other than agricultural, can be met in existing institutions, either in the colonies or here. A mere agricultural college, on the other hand, would doubtless be cheaper, and might satisfy local requirements and the desires of the planters; but it would do so at the cost of its usefulness to the Mother country.

To be successful, it is essential that the proposed institution should enlist the sympathy and support of Cambridge, Edinburgh, Reading, Kew. Its object must be not merely to *spread* knowledge, but to *increase* it. It must provide facilities, therefore, not only for teaching, but research. Our college must include a Tropical Research Station for students from the United Kingdom to study tropical problems on the spot.

On the spot. What spot? This is a thorny question. The British Empire undoubtedly contains many suitable spots, but it seems to me that above all others, two localities stand out pre-eminent. In size, wealth, population, healthiness of climate, and variety of cultivation, as well as in their central situation, no other colonies appear so suitable as the two great fertile islands of Ceylon and Trinidad. As between these two, I cannot attempt to decide. I can make no claim to impartiality; and I have never visited Ceylon. But surely in the Empire there is room for two such institutions. And I do say this, that if the College or if one of two such Colleges, is to be situated in the West Indies, then the fact of the existence of the Imperial Department of Agriculture will be of enormous advantage.

The Imperial Department was established about fifteen years ago, as the outcome of one of the recommendations of the Royal Commission of 1897, and under its successive Commissioners, Sir Daniel Morris, and Dr. Watts, it has done excellent work. It has already its staff of experts engaged in research, and is therefore well suited to become the nucleus of a University College. It is, however, situated in the island of Barbados; and if I may say so in the presence of Dr. Watts, its work in Barbados is done. Barbados is a small island with only one industry—sugar; and its sugar industry is already well cared for by a capable Local Department of Agriculture. Neither in soil nor in climate is Barbados typical of the other West Indian Colonies, and it is no longer the junction of the various steamer services. If, then, the Imperial Department were transferred from Barbados to Trinidad, you would renew its usefulness, you would enlarge its field, and you would lay the foundations, and lay them firm, of a Tropical College of Agriculture which would be of service to our whole Empire. (Applause.)

COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date July 14, with reference to the sales of West Indian Sea Island cotton :—

Since our last report the sales of West Indian Sea Island have been confined to about 70 bales Jamaica at 14*d.* and 80 Bales St. Vincent 21*d.* to 25*d*, with a few St.Kitts 16½*d.* to 19½*d.*

The market is dull and the only enquiry is for cheap cotton round 14*d.* and superior cotton from St. Vincent. The medium grades have recently been quite neglected, and any offers that spinners may make for these qualities will be in order to put into stock; consequently their ideas will be lower.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending July 12, is as follows:—

Without any sales this week, we have only to report the market as quiet, and renew our last quotations.

We quote, viz.:

Extra Fine	28c. to 29c.	= 16*d.* to 16½*d.*	c.i.f., & 5 per cent.
Fully Fine	26c. to 27c.	= 14¾*d.* to 15¼*d.*	,, ,, ,, ,,
Fine	25c.	= 14¼*d.*	,, ,, ,, ,,
Extra Fine off in preparation	24c. to 26c.	= 13½*d.* to 14½*d.*	,, ,, ,, ,,
Fully Fine off in preparation	22c.	= 12½*d.*	,, ,, ,, ,,
Fine off in preparation	20c.	= 11½*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to July 12, 1913, were 2,703 bales, 6,713 bales, and 4,720 bales, respectively.

COTTON IN EGYPT.

In a recent number of the present volume of the *Agricultural News* (No. 292) were presented interesting particulars concerning the object and the work of the Agricultural Bank of Egypt. In the present issue, the information given below regarding the cultivation of Egyptian cotton, abstracted from a paper by the Superintendent of the Peradenyia Experiment Station, should prove of equal interest to readers of this journal.

ADAPTABILITY OF COUNTRY FOR EGYPTIAN COTTON.

There are several factors that are not generally considered by cotton planters in countries other than Egypt, who attempt to grow Egyptian cotton. The first is, that Egyptian cotton may almost be regarded as an exotic, seeing that Egypt is quite an exceptional country for growing it to perfection, it being a land where neither drought nor flood nor frost occurs. A second consideration is, that the soil is perhaps one of the richest alluvial deposits in the world—rich, brown mud brought down from the Abyssinian mountains by the Nile, and with which the land is replenished every year. Thirdly, by the wonderful system of irrigation adopted, the amount of water required by the cotton plants can be gauged to a nicety, and it is of primary importance that the young plants should not have too much at first, and that there should be plenty during the bolling season; though even then it must be carefully regulated, or over-watering will lead to shedding of the bolls. Fourthly, Egypt has practically no rainfall in the cotton-growing regions, and rain, falling when the cotton is ready for picking, is very detrimental, dashing it to the ground and rotting it. And, lastly, the demand for Egyptian cotton is a limited one, as it is too fine for ordinary commercial purposes, and is generally used mixed with American cotton. The limited demand is especially noticeable in the case of new varieties such as Sakellarides or Nubari, the latter of which is said to be of particular value for the canvas lining of motor-car tyres. Egypt herself can over-supply the demand in these special varieties, and it is therefore suggested that any planter wishing to grow Egyption cotton should avoid these and keep to the original and good-all round Mit Afifi.

PRICE OF COTTON AND RENT OF LAND.

Although the price obtained for Egyptian cotton is so high, Re. 1 (1*s.* 4*d.*) per ℔. being paid for first-class Mit Affi on the spot, and for the other varieties, 1*s.* 5*d.* and 1*s.* 6*d.* per ℔., as against 6*d.*-7*d.* for American, it is not the fellah or cultivator who profits, for the purchase price and rentals of land are very high. For first-class land 2,000 rupees is a moderate price, and as much as 225 rupees the rental for one year. Practically there are no private European planters, but there are a few big European land companies, engaged for the most part in reclaiming either the salt, waste land along the seacoast of the Delta, or where the sands have encroached on the good soil.

On good lands, cotton is generally alternated with either maize, wheat, barley or beans. The fellah does not generally manure his cotton save with a little manurial refuse from his village and cattle sheds, with the mud thrown up in cleaning the canals, or by ploughing in his clover after the first or second cutting. With careful cultivation, however, and provided his crop has been free of insect pests, he can count on obtaining 1,260 ℔. of seed-cotton per acre. But where artificial manures are applied, as much as nearly double that quantity has been obtained.

METHOD OF CULTIVATION.

After the land has been thoroughly ploughed and ridged, the seed is planted in May by hand two-thirds up the ridge, eight or ten seeds to a hole, and the distance apart according to the soil, the average being 2½ by 1½ feet. About a month after sowing, the young plants should be thinned out, eliminating all small and sickly ones and a species of poor cotton called 'Hindi' or Indian cotton, which is invariably mixed in with the good, leaving only two strong plants in each hole. The plants then receive their second watering, the first having taken place directly after sowing the seed—thus a month elapses between the primary waterings. Thereafter the periods decrease in time—twenty-five, twenty, eighteen, and twelve days, respectively.

Great care is exercised not to allow any water to stagnate on the land, as this is fatal to cotton, good drainage being as essential as water; and this one thing Egypt has to watch carefully, lest her soil becomes over-irrigated and the subsoil water-logged. To guard against this, big drainage pumps are now being erected, by which the surplus water is pumped into the sea.

The above account will be continued in the next issue of the *Agricultural News.*

VETERINARY NOTES.

DISINFECTANTS AND DISINFECTION.

A useful account of some common disinfectants and the ways of employing them is given in the *Agricultural Journal of the Union of South Africa*, for May 1913. The writer, W. Jowett, F.R.C.V.S., of the Veterinary Division of the Department of Agriculture, commences by referring to the importance of destroying carcases of diseased animals, either by thorough burial, or by cremation. In regard to the burial of animals that have died from such a disease as anthrax, it is noted that care must be taken to prevent soiling the ground with any discharges from the dead body.

METHODS OF CREMATION.

In connexion with cremation, the writer advocates the following procedure: A trench about 9 or 10 feet long, 5 feet wide and 5 feet deep should be almost filled with wood arranged cross-wise and moistened with kerosene. The importance of ventilation to ensure complete combustion in the process of cremation is strongly emphasized, and in this connexion, reference is further made to the ingenious method of cremating carcasses originated by Major-General Smith. Briefly it consists in digging two trenches in the form of a cross, over which are placed two iron rails. The fuel is put on the rails, which bridge the centre of the cross, and the carcass is placed on the top of this. In some cases it is desirable to dismember the body before the cremation.

GASEOUS DISINFECTANTS.

Proceeding to discuss the employment of common disinfectants in the prevention of diseases, mention is made first of sulphur dioxide gas, which, as a fumigation agent, is useful for destroying rats, flies, fleas and various biting flies which may serve as intermediaries and propagators of diseases. In regard to the generation of this gas, it is noted that the sulphur should be moistened with spirit in order to favour combustion. About 5 lb. of sulphur may conveniently be burned for every 1,000 cubic feet of space in the building to be disinfected. It is pointed out that two disadvantages of sulphur dioxide are that it bleaches colours and has only a superficial action.

The next disinfectant considered is formaldehyde, a substance which has very powerful germicidal properties. The gas can be prepared from a whitish powder known as as paraform, or the disinfectant, dissolved in water may be simply sprayed. In employing the gas itself, the most convenient method is to prepare it from formalin by the action of potassium permanganate. It is recommended that for every 1,000 cubic feet of air space, 20 oz. of formalin and 16¾ oz. of potassium permanganate crystals should be used. Before evolving the gas, the walls must be sprayed with water, and doors and windows made as air tight as possible.

CHEMICAL SOLUTIONS.

Referring next to chemical solutions, the writer states that it is always advisable to apply hot solutions in preference to cold ones, owing to the greater germicidal power of the former. It is strongly emphasized that before disinfecting stable fixtures, harness, utensils, etc., a preliminary cleansing with soap and boiling water is essential.

Although, in the next section, the different forms of carbolic acid are recommended for use, cresol, or straw-coloured carbolic acid is believed to be the cheapest, most satisfactory and useful disinfectant for general purposes Crude carbolic acid, because of the oil it contains, is of uncertain action. The interesting fact is noted that the germicidal effect of carbolic acid is increased by the presence of common salt, but that the presence of oil and grease diminish the germicidal power. The carbolized oil at one time so extensively employed by attendants on animals is now known to possess little, if any, germicidal power. Lysol is also recommended as a satisfactory disinfectant, particularly for surgical purposes. It is rather expensive for common use.

Observations are next given concerning the employment of corrosive sublimate. Most of the disinfectants so far described cannot be conveniently used in cowsheds or dairies owing to their objectionable odour. Corrosive sublimate requires cautious use because it appears to be harmless. It is a white crystaline salt not readily soluble in water, and forms an odourless, colourless solution which is extremely poisonous and must be used for utensils only with the greatest care. A solution 1 in 1,000 suffices for the destruction of non-sporulating organisms in a few minutes. To kill spores, a 1 in 500 solution may be employed for an hour or so.

CHLORIDE OF LIME

For the disinfection of cars, trucks and floors of stables, etc., a freshly prepared solution of chloride of lime (6 to 8 oz. per gallon) may be used. When fresh, chloride of lime is a good general disinfectant and deodorant, but it is readily attacked by various kinds of organic matter. Although chloride of lime has been used for disinfecting diseased excreta, it is stated that cresol is more dependable for this purpose.

DISINFECTION OF LEATHER.

The account of the routine of disinfection, given at the end of the article under consideration, contains several facts which may be noted briefly in this abstract. Infected leather work and leather goods should not be steamed or boiled or treated with formalin. The best procedure is to scrub them with soap and water, and then immerse them for two hours in a bath of cresol. The disinfection of skins and hides may be done by immersion for twenty-four hours in a bath of 2 per cent. cresol or in a solution of corrosive sublimate (1 in 1,000). Formalin and steam cannot be used because they injure skins. The substances recommended, however, have no such destructive action.

In preparing lime-wash and chloride of lime for disinfecting walls, light coats applied, are better than heavy ones, as the latter are apt to peal off. It may be noted that the addition of about 5 per cent. of common salt to lime-wash will tend to render the latter more adherent. Glue is sometimes used for the same purpose.

* * *

An interesting article on milk production is published in the *Journal of Agriculture* of New Zealand (May 15, 1913). This deals principally with the effect of change of pasture and feed on the yield of milk. It has been demonstrated by means of tests that a complete change for a dairy herd as well as for sheep is conducive to better results: if the cow-paddock be divided into small areas so that the animals may be continually moved on to clean ground, the increased milk-yield soon compensates the outlay in extra fencing. The same principle of change applies to feeding in general, and the matter would seem to be worthy of the careful attention of stock-owners in the West Indies.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number of the *Agricultural News* describes in a general way the present state of motor cultivation in different parts of the world. There is reason to believe that this form of power is likely to come into more common use in tropical agriculture.

On page 243, a brief account is given of interesting facts concerning a recent investigation of the date sugar industry in Bengal.

An article, on page 245, describes an important meeting recently held in London to discuss the proposed establishment of an agricultural college in Trinidad and in Ceylon.

Veterinary Notes, on page 247, contain information concerning disinfectants and their employment in respect of estate animals.

Under the caption Insect Notes, on page 250, will be found an interesting account of pests observed in Antigua.

The recently issued Reports on the Botanic Stations at St. Kitts-Nevis and Montserrat, are reviewed on page 251.

Fungus Notes, which will be found on page 254, continue from the last issue but one of this journal, the subject of the spotting of plantation Para rubber. A second article also appears in continuation of the subject of the new disease of the castor oil plant.

A West Indian Herd Book.

In reproducing the main arguments connected with the above subject, put forward in an editorial in a recent issue of this journal (Vol. XII, No. 284), the *Hawaiian Forester and Agriculturist* (March 1913) suggests that the establishment of a Herd Book in Hawaii would be useful too. The subject has also been favourably considered in Barbados.

In may be remembered that the principal idea was that the registration should be done locally by the different Agricultural Societies, and a general record kept at a central office. The ultimate object would be to produce from already existing animals in the West Indies, lines of three distinct types, for breeding purposes: working animals, milch animals and beef animals. The registration of these superior and definite grades would benefit the seller, safeguard the buyer and encourage careful selection and good breeding in general. It would tend to eradicate disease—in particular tuberculosis—and it would make stock-breeding more interesting without incurring a great deal of extra labour and expense.

A commencement might be made by instituting a Registration Class for bulls and cows at the Agricultural Shows. It would be necessary to draw up score-cards for awarding marks, and to appoint competent judges disinterested, commercially, in the animals dealt with. The animals ought to pass a medical, as well as a breeder's inspection, and consideration should be given to pedigree as far as reliable records are available.

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Rainfall in the West Indies during June.

The following set of figures obtained from various sources gives an idea of the rainfall in inches throughout the West Indies and British Guiana during the month of June 1913. Where a note is not added to the contrary the returns were taken at the Botanic Stations in the different islands:—

Demerara (average for county), 10·0; Berbice (ditto), 9·0: Essequibo (ditto), 14·0: Trinidad (San Fernando), 9·89; Barbados (Office of Imperial Department of Agriculture), 2·90; Grenada (Richmond Hill), 6·55; St. Vincent, 10·61; St. Lucia, 7·03; Dominica, 3·49; Montserrat (Grove), 1·56; Antigua, 1·75; St. Kitts, 0·82; Nevis, 2·23; Virgin Islands (Tortola), 3·86.

The weather, on the whole, during June was abnormally dry, particularly in St. Kitts, Antigua, and Montserrat (see page 252), and to some extent in Trinidad and British Guiana. The recent rains in July, however, have greatly improved cultivations in these places. The Windward Islands, during June, experienced excellent growing weather, favourable in St. Vincent for the development of the young cotton crop, and in St. Lucia, seasonable for the citrus cultivations.

Agricultural Affairs in British Honduras.

Mr. Campbell's Report on the Botanic Station for 1911 is practically restricted to the internal activities carried on during the year. There are, however, several facts of general interest worth noting.

One possible line of development for the colony lies in the direction of coffee growing. During 1910, 128,868 lb. of this product were imported—a circumstance which should cause attention to be given to the successful results obtained at the Botanic Station in connexion with the cultivation of Liberian coffee plants. Coco-nuts have already become an important crop in British Honduras, but little attention seems to be paid to clearing bush-growth, to drainage, or to the removal of dead trees. The latter form of neglect is not unlikely a cause of the continual appearance of bud rot. A root and stem disease, and a leaf disease of coco-nuts, are reported.

During the year under review, 1,200 Para rubber seedlings were sold at the Station, together with 1,532 coco-nut plants, 360 Castilloa, 200 Liberian coffee, 200 various fruit plants, and 420 ornamental plants. Four hundred and eighty-six new seedling sugar-canes were distributed free. The total rainfall at the Botanic Station for 1911 was 94·37 inches.

Mutation in Micro-organisms.

A short time ago, when the full report of the papers read at the Fourth International Conference on Genetics was published, an editorial in the *Agricultural News* (Vol. XII, No. 287) was devoted to a review of the results that the report made public. In the article, considerable attention was given to the phenomenon known as mutation, but considerations were confined mainly to the higher realms of the plant and animal kingdom. In view of the fact that micro-organisms are—in the words of the *Gardener's Chronicle* (June 28, 1913)—'the unconscious arbiters of the destinies of the world of higher plants and animals'—no excuse is needed for giving prominence to some interesting facts which that journal publishes in regard to sudden and extraordinary changes which Mr. Clifford Dobell in the *Journal of Genetics*, Vol. II, No. 4, says these minute forms are capable of undergoing.

Among bacteria, few have been studied more closely than the series of forms which include at one end the 'harmless'—or rather, useful—*Bacillus coli*, and at the other, *Bacillus typhosus* of typhoid fever. One character which distinguishes these end members, consists in the power possessed by *B. coli*, and not possessed by *B. typhosus*, of splitting up lactose (sugar) and thereby forming lactic acid.

It has been discovered that the middle members of the *B. coli* group, which normally lack this power, may suddenly acquire it. What is still more remarkable, not all the cells of the race are able to acquire the new character, and there are indications that the transmission of this capacity proceeds according to the Mendelian idea of segregation.

Facts like these greatly add to the complexity of pathology, and the particular case in question calls to mind the relation of *B. coli* to the coco-nut palm. May not, also, the parasitism which apparently induces bud rot have been occasioned by mutation? If so, activity in the direction of the botanical selection of host resistance might prove to be a possible means for eliminating the organism's harmful characteristics.

Synthetic Rubber.

The *India-Rubber Journal* (June 28, 1913) contains a note to the effect that the Synthetic Products Co., Ltd., have removed from their smaller works in Essex to a much larger establishment with four and a half acres of land, near King's Lynn. These works, for the present, will be devoted only to the manufacture of acetone and fusel oil. When investigations have been completed, they will proceed with synthetic rubber. The first plant for this purpose will be erected at the works in Essex.

Anyone who may imagine that investigators, and those financially interested in synthetic rubber, have relaxed their energies, will be further interested to know that in the recent issue of patents given in the *India Rubber World* (July 1, 1913) no less than five have been granted for a 'Caoutchouc-like substance and process of making same' to Herr Hofman and his collaborators in Germany. A sixth German patent for 'Producing rubber-like compounds' has also been issued.

That synthetic rubber can be satisfactorily produced has for some time been definitely established. Briefly, the process is the conversion of starch into fusel oil, then into alcohol and that into isoprene, which in turn, is changed into rubber. The most difficult problem, which yet remains to be solved, is the commercial one concerning the want of a cheap and abundant source of starch.

The West Indies in Canada.

The new (1913) edition of the booklet entitled the 'West Indies in Canada' has just been issued by this Department. The object of the publication, which is distributed *gratis* at the Toronto National Exhibition, is to help to bring together West Indian and Canadian interests. The new edition is considerably larger than that of last year, and is profusely illustrated. A fresh feature is the insertion of interesting views of each island immediately before the advertisements relating to each, respectively. This helps to advertize the island, to give prominence to the advertisements, and make the section (which has doubled in size) more attractive in every way.

Many of the tables of statistics have been extended to include figures for former years. Several interesting developments are thereby brought out, as, for instance, the growth of the Canadian automobile trade and brush and broom trade with the West Indies; whilst on the other side, for example, the quick advance of the fruit industries of these Colonies is equally well demonstrated.

Apart from its immediate function, the booklet should be of value to schools for educational purposes. A limited number of copies are available, and may be obtained on application to the Agents of this Department.

INSECT NOTES.

PESTS IN ANTIGUA.

The *Bulletin of Entomological Research* for May 1913 (Vol. IV, Part 1) contains an abstract of a report on Insect Pests in Antigua in December 1912, by H. A. Ballou, M.Sc., with illustrations from photographs by the writer of the report.

The article deals with the lime twig borer (*Elaphidion mite*, Newman) which appeared in certain lime cultivations in Antigua toward the end of 1912 causing some alarm. This portion of the report formed the subject of the Insect Notes in the *Agricultural News* for March 15, 1913 (Vol. XII, p. 90), but notes on other insect pests observed at the same time were omitted for lack of space. It is these latter which have been referred to, besides those on the lime twig borer in the *Bulletin of Entomological Research*, to which attention is now directed.

After the lime twig borer, the principal insect pest found attacking limes was the California red scale (*Chrysomphalus* [Aspidiotus] *aurantii*), which had caused a considerable amount of damage to citrus in several localities in Antigua, being apparently much more destructive than usual on account of the severe drought which had been experienced during 1912.

Other pests of limes were those to be noted ordinarily in Antigua and other islands: the purple scale (*Lepidosaphes beckii*); the white scale (*Chionaspis citri*); the West Indian red scale (*Selenaspidus articulatus*); and the lantana bug (*Orthezia insignis*). These, however, were not seriously abundant, although of fairly general occurrence.

The green scale (*Coccus* [Lecanium] *viride*) was not recorded during the visit.

Two species of lady-bird beetles were found commonly on limes, but were more especially prevalent where the California red scale was abundant. One of these, was the well-known red lady-bird (*Cycloneda sanguinea*), and the other, a minute black or bluish black species not larger than a pin's head.

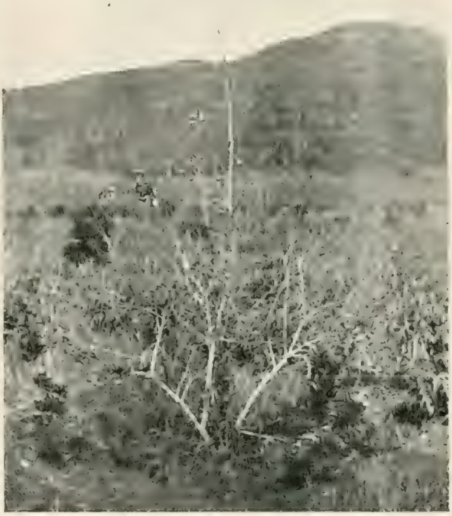


Fig. 11. Young Lime Tree Dying from Attack of California Red Scale.

Cotton fields were carefully examined for any signs of the flower-bud maggot, but this insect was not at all in evidence during the time of the visit. Shortly afterwards (December 29) it was discovered by Mr. Jackson, Curator of the Botanic Station.

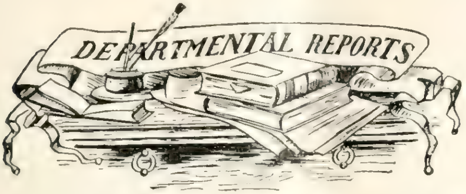
Cotton was attacked by boll worm on two plantations. In one of these instances a considerable amount of damage had been done. In one particular field, corn and cotton were growing together, and it seemed likely that the corn provided breeding places for the boll worms, which went from the corn to the cotton.

It was recommended that the corn should be removed at once and that ears which were ripe enough for grain should be saved and the stalks fed to the cattle. It was advocated, too, that children should be sent into the field to collect all injured cotton bolls to be destroyed by being thrown into the cattle pens. It was further suggested that by planting corn in the same field of cotton, an attractive place for egg laying might be provided at the time when the worms, which had escaped, had matured and the moths emerged. If this were done, however, it was pointed out that it would be necessary to cut the corn and feed it out before any worms which might attack it should have an opportunity of becoming full fed.

In the second plantation, the boll worms were less numerous, but they had caused some injury, the attack being mostly on the young bolls. The presence of a small amount of Guinea corn in the field probably accounts, to a certain extent, for the unusual numbers of boll worms found in this enclosure. At Skerretts Experiment Station, cassava was attacked by the larvae of the common Sphingid moth, *Dilophonota ello*, and sweet potatoes, by the larvae of a butterfly, *Junonia* sp. The larvae of *Diplophonota ello* were of two distinct colourings, green and purple; but the moths reared from these were all alike. The occurrence of a butterfly larva as a pest of sweet potatoes in the West Indies is unusual, this probably being the first record of such an attack. The editor of the *Bulletin of Entomological Research*, appends a note to the effect that this species of butterfly is probably *Precis lavinia zonalis*, Feld.,—the only species of the genus yet known from Antigua. The larvae of another Nymphalid butterfly (*Acraea terpsichore*, L.) have been recorded by Mr. C. C. Gowdey as damaging sweet potatoes in Uganda.

The ordinary potato worm, the larva of *Herse* [Protoparce] *cingulata*, occurs as a pest of sweet potatoes in Antigua but it was not observed during this visit. A small green caterpillar was present feeding on the leaves of the sweet potato but the adult was not obtained.

The cowpeas at Skerretts were attacked by a boring larva in the same manner as that on cowpeas recorded in Barbados in 1911 (see account of attack of *Ballovia cistipennis* in the *Agricultural News*, Vol. XI, p. 234), and that on Canavalia in St. Kitts observed by the Entomologist during a visit to that island in 1912. The cowpeas at Skerretts were also attacked by leaf-eating caterpillars—the larvae of the woolly pyrol moth (*Thermesia gemmatalis*). Associated with these caterpillars were unusually large numbers of a red and black predaceous bug, *Zelus rubidus*, which were probably feeding on the caterpillars, although this was not actually observed.



DEPARTMENTAL REPORTS

ST. KITTS-NEVIS: REPORT ON THE BOTANIC STATION, 1911-12.

During the year 1911-12, the climatic conditions of the Leeward Islands as a whole—with the exception, perhaps, of Dominica—were characterized by rather meagre receipts of rainfall. In St. Kitts it would appear from the Report on the Botanic Station, that, owing to the prolonged drought, it was hardly possible to do more than keep by constant watering the existing plants and trees, in the gardens, alive.

In that section of the publication which deals with plot experiments at the Botanic and Experiment Stations, it is stated that the following crops were under experiment during the year: sweet potatoes and other provision crops, ground nuts, pine-apples, green dressings, tobacco, cotton, Guinea corn, onions, Indian corn, and, to a larger extent than those just mentioned, varieties of sugar-cane.* In connexion with the trials of provision crops the work was supplemented by the distribution of a large number of cuttings, seedlings and seeds.

COTTON EXPERIMENTS.

The most interesting experiments, and those, perhaps, of greatest economic importance, were the ones conducted with cotton. Good results were obtained from the hybrid cotton seeds (Barbados Sea Island cotton × St. Eustatius). The trees were vigorous, producing a large number of bolls, with lint of good character, strong, regular, fine and lustrous, with an average length of 45 mm. This experiment, which has so far been very successful, will be carried on during future seasons. Satisfactory trials were made with Thornton's hybrid cotton. In regard to manurial experiments with cotton, the results of the year under review, together with those of former ones, indicate that the addition of artificial manures under the conditions existing at La Guèrite (the Experiment Station) has not been attended with remunerative returns.

The special selection work with cotton, started four years ago, has been continued on the same lines. The practical results of the selection work with cotton in general is reported on as being most encouraging, since the cotton growers appear now to realize that the returns from this selected seed are such as to warrant their planting, in many instances, the entire crop from it.

GENERAL PROGRESS.

The next section in the report, Notes on Economic Plants, refers to the small area, but satisfactory condition of cultivations of cacao, rubber and limes. In regard to progress in the chief industries, the subject dealt with next, a prediction is made of the advantages which were thought, at the time of writing, would accrue from the establishment of the St. Kitts Central Sugar Factory. The results obtained by this factory during the current year have amply satisfied these expectations.

The publication continues with an account of the cotton industry at Anguilla. Here, as in St. Kitts, the industry has suffered through drought and the attacks of insect pests, particularly from the cotton worm and from 'black bugs'. Mr. Carter Rey, the chief cotton grower in the island and the owner of the Central Cotton Ginnery, remarks upon the fact that this latter pest is extremely difficult to control.

Following upon an account of satisfactory progress as regards agricultural instruction at the Grammar School, the publication ends with the report of the Agricultural Instructor, Nevis. In this, as in the other sections of the publication, there is evidence to show a continuance of that useful activity which characterizes the Agricultural Department of the Presidency of St. Kitts-Nevis.

MONTSERRAT: REPORT ON THE BOTANIC STATION, 1911-12.

This report reviews the work and progress of the Agricultural Department, Montserrat, for the year 1911-12. The work in the nurseries and that in connexion with the distribution of plants has included observations on various trees of interest, amongst which observations may be mentioned the fact that *Eucalyptus cornuta* and *E. rudis* have made satisfactory growth. A fair amount of work is recorded in regard to plant distribution. This latter line of activity is marked by the large number of lime seedlings and sweet potato cuttings sent out during the year under review.

COTTON EXPERIMENTS.

The plot experiments with cotton, which occupy so important a position in the routine of the Department, have included interesting trials with immune cotton from the Sea Islands of South Carolina, and with Egyptian Sakellarides—a type which shows a considerable amount of adaptability to conditions obtaining in Montserrat. Work on hybrid cottons is still in progress.

PESTS AND DISEASES.

The experiments with limes, next discussed, concern principally the problem of the so-called root disease that has of late years threatened the stability of the lime industry. It may be mentioned that this problem has been, and is receiving the close attention of the scientific officers on the Staff of the Imperial Department of Agriculture.

The section in the report which deals more particularly with fungus and insect pests refers to successful remedial measures for the corn ear worm, and considerable anxiety is expressed in regard to the prevalence of cotton stainers. During the current year, unfortunately, circumstances have not tended to allay this anxiety.

GENERAL PROGRESS.

The succeeding sections on progress in the chief industries indicate the growing popularity of cotton as a staple crop in Montserrat, the area under cultivation for the year under review, being greater than that of any other since the introduction of the crop ten years ago. Much of the success attendant on the cotton industry would seem to be directly attributable to the activities of the Curator in charge of the Botanic Station.

The report concludes with an account of the progress in the minor industries, which include the production of papain and bay oil, and the facts presented appear to show that these industries may in time attain to a considerable degree of importance.

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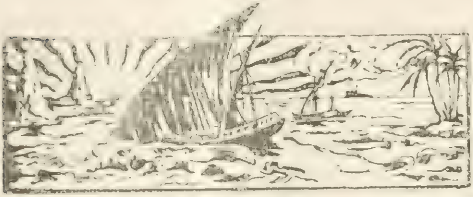
* The results of the St. Kitts sugar-cane experiments together with those conducted in Antigua have been recently issued as a separate report.



GLEANINGS.

It is stated by the Agricultural Instructor, Nevis, that cotton planted in that island during May, has made a fairly good stand. Some of the fields are looking very promising.

The Demerara *Daily Chronicle Mail Edition* (July 4, 1913) publishes articles advocating an extension in regard to the cultivation of bananas and provision crops in British Guiana.

During June, in consequence of the extremely dry weather, all agricultural operations in St. Kitts came practically to a standstill. The young cotton suffered from the drought severely.

In St. Vincent, owing to the favourable weather during the latter part of June, planters were able to make considerable progress with cotton planting. The seed has germinated well on most estates.

In Antigua, during June, there were distributed from the Botanic Gardens: lime plants, 1,300; mahogany seedlings, 70; Eucalyptus, 19; miscellaneous decorative plants, 75; sweet potato cuttings, 30,000.

According to the Curator of the Experiment Station, Tortola, recent weather has been favourable for the growth of canes and the early planted cotton is progressing satisfactorily. The August lime crop is promising.

The Antigua *Sun* (July 1, 1913) calls attention to the large area of bush land in that island, and advocates the allotment of these tracks to labourers on the share system under agreements binding proprietor and labourer alike.

During the twelve months ended March 31, 1912, St. Thomas and St. Croix exported to the United Kingdom, cotton valued at £13,105, and cotton seed valued at £267. (*Diplomatic and Consular Reports*, No. 5070—Annual Series.)

The programme of the seventy-fourth annual show of the Royal Agricultural Society of England has been received. From the plan of the show-yard it may be seen that the Overseas Section occupies a very central and prominent position.

A letter received from the office of the *Louisiana Planter* calls attention to the special Birthday edition of that journal for July 5, 1913. The issue contains an interesting account of the organization and of the staff connected with the paper.

Of those Venezuelan articles the exports of which have increased during 1912 are, Para rubber, Tonka beans, and feathers and plumage. A reduction is shown in the exports of coffee and balata. (*Diplomatic and Consular Reports*, No. 5085—Annual Series.)

It is stated in *The Board of Trade Journal* (June 5, 1913) that by order of the German Government, the cotton experiments in Togoland with Sea Island seed are to be extended, and trials with other types of cotton are also to be carried out in the southern districts of that territory.

According to *Diplomatic and Consular Reports*, No. 5075—Annual Series, the principal cause of the rise in the price of sisal hemp during 1912 was the sudden demand due to increased cereal crops in the United States and the damage caused to hemp in Manila by the violent typhoons.

Referring to the question of the proposed Tropical University for Agriculture, the *Gardener's Chronicle* (June 21, 1913) emphasizes the fact that if established, the institution should be unofficial, and should serve the purposes of agriculture throughout the entire Tropical Dominions of the Empire.

In *Le Bulletin Agricole* for May 1913, reference is made to an article in the *Agricultural News* (Vol. XII, p. 99) dealing with a prize pasture competition at Antigua. The journal alluded to, advocates the usefulness of such competitions. Apparently their introduction into Mauritius would serve a useful purpose.

The production of rubber in Java is rapidly increasing, the total exports for the year 1912 being fully 100 per cent. in excess of those of the previous year. Of this quantity, the greater part is Ficus and Hevea; very small quantities of Castilloa and Ceara rubbers are being produced. (*Diplomatic and Consular Reports*, No. 5083—Annual Series.)

According to the Demerara *Daily Argosy Mail Edition* (July 5, 1913) there has been great scarcity of labour in British Guiana on estates where cane cutting has been going on, but owing to the short intervals of grinding which occur just at present, the dearth is not felt seriously. Canes have been very short, hard and dry, and in many districts the yield per acre has been disappointing.

In connexion with the article on cane ensilage which appeared in the last issue of the *Agricultural News*, it may be of interest to point out that the *Australian Sugar Journal* (May 8, 1913) states that a number of sugar-cane varieties have recently been introduced from New Guinea to see whether any of them are suitable for growth in Southern Queensland for fodder purposes and for making ensilage.

At the recent session of the Legislative Council of Rhodesia, the general opinion of private members was that on financial grounds it was inexpedient to proceed with the establishment of an Agricultural College in Southern Rhodesia during the present year. It is considered likely, however, that definite action will be taken by the Government during the next session. (The *Rhodesia Agricultural Journal*, June 1913.)

STUDENTS' CORNER.

AUGUST.

First Period.

Seasonal Notes.

Ratoon canes should receive attention at this period of the year. Where the banks have been ploughed and mulched, the surface of the ploughed bank should be kept constantly stirred with the cultivator, to conserve the moisture in a similar manner as does the mulch of trash on the other row. Nitrogenous manures, such as sulphate of ammonia, nitrate of soda, nitrate of lime, nitrolim, may now be applied. Useful experiments with these manures can be arranged where the canes are weighed at a factory. As regards the young cane crop, attention should be paid to any signs of the attacks of moth borer, which can be detected by the occurrence of 'dead hearts'. These, if possible, should be cut out and burnt. If the young cane crop has received a set back caused by dry weather, as has recently occurred, for instance, in St. Kitts, a careful watch must be kept for the appearance of fungus diseases.

In connexion with the lime crop, nursery beds should be prepared, and seeds sown as rain permits, in rows 8 inches apart. One bed 100 feet × 5 feet will give 5,000 to 6,000 strong seedlings. The effect of mulching with fine dust can, in dry districts, be seen on these beds. The present time is favourable for combating scales and fungi. Note the good and bad effect of spraying.

In regard to the manufacture and distribution of lime products, describe the principle of the new machine recently placed on the market by means of which limes can be écuelled. What yields do the makers claim per barrel, and what is the cost of one of these machines?

The student is advised to notice the present price of otto of limes and to compare it with that of last year. Comparison may also be made between the size of the packages usually employed for shipping raw lime juice in contrast with those utilized in the exportation of the concentrated material.

An important by-product of the lime cultivation is lime skins. They may be fed to stock, and the surplus may be made into ensilage, thus providing succulent food out of crop time. In Dominica, the skins are never applied as a manure direct: this would certainly injure the trees They must first pass through the pen.

In recent issues of the *Agricultural News* there has been presented a considerable amount of information dealing with the subject of agricultural engineering. In connexion with the editorial in this issue refer back to the article on an automatic plough (*Agricultural News*, Vol. XI, p. 408). This will suggest considerations in regard to the question of single and multiple mould-board, automatic ploughs. In connexion with the engineering side of tillage read the note on the effect of plough hitch on draft (*Agricultural News*, Vol. XII, p. 287) and that describing recent progress in the employment of dynamite in soil cultivation (*Agricultural News*, Vol. XII, p. 136). Amongst the machinery described in connexion with the collection and harvesting of crops, there is a new cotton picker dealt with on page 118 of this volume, and a machine for tapping rubber, on page 25, and another for extracting rubber from bark, on page 223. Of great importance is the machinery referred to in regard to the kiln-drying of grain, on page 213. A new hoisting device for sugar-cane is mentioned on page 230, together with other matters connected with practical mechanics.

Agricultural engineering is a wide subject. As well as mechanical engineering, it may be considered to embrace civil engineering, surveying, drainage, irrigation, road-making and the like. In due course, a series of concise articles on surveying and mensuration will be prepared and published in future issues of this journal.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) How does a bee collect honey?

(2) Under what conditions is a dust mulch more advantageous than one composed of leaves and bush?

INTERMEDIATE QUESTIONS.

(1) What are contour drains? From which will water run first—a shallow or a deep drain?

(2) Compare Paris green, as an insecticide, with London purple. State the source from which each is derived.

FINAL QUESTIONS.

(1) Write a few observations on the following topics: (a) the present price of coco-nuts; (b) the importance of quality in West Indian cotton; (c) progress in the West Indian lime industry.

(2) Contrast the advantages and disadvantages of Para and Castilloa rubber cultivation, respectively.

It is sometimes necessary in analytical work connected with the production of agricultural produce to cool different glass vessels with flowing water. An arrangement illustrated in the *International Sugar Journal* for May 1913, comprises a perforated ring which is fitted by a rubber adaptor to an ordinary tap. Vessels to be cooled are placed underneath, and the water on being turned on flows over the vessel in the form of a spray. The arrangement is often very convenient in hydrometer work where it is necessary to cool the liquid to be tested down to a definite temperature. The arrangement can also be used, where a hot water-supply exists, for heating purposes.

Publication No. 144 of the Wellcome Chemical Research Laboratories describes a chemical examination of the bark of *Erythrophlœum guineense.* The investigation is chiefly of interest because the bark in question is an exceedingly violent poison, and is largely used in West Africa for criminal purposes. The most efficient antidote consists in the prompt administration of an emetic, or use of the stomach pump, with subsequent stimulant remedies. The plant is known under the common name of sassy bark, mancona bark, red water tree bark, and casca bark. Another popular—and significant—name is doom bark.

It was reported at the one hundred and thirteenth meeting of the Council of the British Cotton Growing Association that arrangements had been made for the King of Uganda, together with his tutor and four native chiefs, to visit Manchester on July 28 to 31. The arrangements will include a visit to a cotton-spinning and weaving mill, a calico-printing works and a machinists; also an inspection of the Manchester Ship Canal and a visit to the Royal Exchange.

FUNGUS NOTES.

THE SPOTTING OF PLANTATION PARA RUBBER.

In continuation of an article on the causes of this infectious condition of rubber, published in the last issue but one of the *Agricultural News*, an account is now presented of the methods of treatment, as described in Bulletin No. 16 of the Department of Agriculture, F.M.S. At the outset it is emphasized that it is essential that the cause of the discoloration should be ascertained before any preventive treatment can be applied.

STEAMED CREPE SUSCEPTIBLE.

One important condition under which spotting occurs is in damp low-lying situations where the facilities for drying are not adequate: where good access and good circulation of air are not obtained, spotting may be frequent. Reviewing some of the forms of prepared rubber which develop spotting, it is stated that thin crêpe appears to be less susceptible than thick crêpe; while artificially dried crêpe, as far as has been observed, has not been found to become spotted. Steamed crêpe which takes a comparatively long time to dry, appears to be very susceptible to spotting.

VALUE OF RAPID DRYING.

Owing to the fact that no organism can grow if there is not sufficient water present, it would appear that rapid drying should diminish the quantity of spotted rubber. In this connexion it is interesting to note that rapid artificial drying, which is completed in a few days, altogether prevents the development of spotting. It would seem that the adoption generally of artificial drying on a larger scale has been prevented by the fluctuation in the form of rubber which meets with favour on the market.

SMOKED RUBBER IMMUNE.

Spotting due to fungi and bacteria has not been found on smoked rubber. In most cases this would appear to be due to the presence of creasote and phenol compounds in the fuel employed.

USE OF FORMALIN IN THE FIELD.

In dealing with the possibility of applying chemicals, it is pointed out that the objection to the use of metallic salts is the fact that, the presence of even small quantities of of such substances in plantation rubber might bring the product into disfavour on the market. As regards fluid antiseptics, carbolic acid cannot be employed owing to its dark colour. For preventing spotting due to field infection, the use of 1 part of formalin in 400 of latex is advocated as likely to prove efficacious. The cost of formalin in London is about 55s. per cwt

SULPHUR FUMES.

The means of sterilization of the drying houses next receive attention, and the most suitable for the purpose is stated to be the employment of sulphur fumes. It is important in this connexion to render the buildings as air-tight as possible. It would probably be necessary to repeat the disinfection at intervals.

IMPORTANCE OF ISOLATION.

Lastly, emphasis is laid on the matter of isolation of spotted rubber. When spotting is caused by *Bacillus prodigiosus*, the rubber should be isolated as early as possible. Sheet or crêpe which is spotted by the bacillus should not be packed among other rubber for shipment. In conclusion, it is stated that there is an accumulation of evidence, which indicates that clean rubber packed under most careful supervision was found to be spotted on arrival in London. This point will presumably be further investigated.

A NEW DISEASE OF THE CASTOR OIL PLANT.

A continuation of this subject, an account of which was commenced in the last issue of the *Agricultural News*, is the following description of interesting facts of practical significance connected with the behaviour of the fungus (*Phytophthora parasitica*) in pure culture and in inoculation tests.

DIFFICULTIES IN OBTAINING A PURE GROWTH.

It is generally a troublesome matter to obtain a pure growth of fungus in the case of leaf diseases. In the present investigations, direct inoculation from diseased leaf to culture medium was always accompanied by the introduction of fungus saprophytes and bacteria. A successful procedure, however, was to cause a piece of diseased tissue to discharge zoospores (swarm-spores) in sterilized water. A sterile piece of healthy leaf was then inoculated with these spores, followed by a transfer of the new growth on to nutrient pith. Finally, a portion of the new mycelium was introduced into a tube of French bean (*Phaseolus vulgaris*) juice agar, which gave in two days, a pure, rich, healthy culture.

BEHAVIOUR OF FUNGUS IN CULTURE.

Amongst other things it was observed that sporangia (fruit bodies) from cultures, made when the temperature was very high, did not discharge their swarm-spores as readily as when the temperature was low. Light, also, seemed to influence the formation and emission of zoospores. It hastened their discharge.

RESTING-SPORES.

In cultures, and on inoculated castor fruits, a second spore form was found,—the resting conidium or so-called chlamydospore, which also occurs in the case of the Cacao Phytophthora. Extremes of temperature do not retard the formation of these spores as occurs in the case of zoospores. When sown in water, resting-spores germinate readily in twenty-four hours. The germ-tubes either directly produce sporangia, or resting conidia or vegetative hyphae. If kept moist, chlamydospores retain their vitality for over nine months, but if they are completely dried, their germinating power does not last for even a week. This fact again emphasizes the close relation between climatic conditions and the reproduction of this parasite.

SEXUAL REPRODUCTION.

The fungi belonging to the group represented by the organism in question is not content to propagate itself by budding, or vegetative means alone. It has a sexual stage, and in the case of *Phytophthora parasitica*, the oogonium (or female element) arises from within the antheridium (or male element) This fact is of importance for purposes of classification. It distinguishes this fungus from all other species of the genus except *Ph. Colocasiæ*.

INOCULATION EXPERIMENTS.

The results of inoculation experiments are always of interest to the general reader because they determine to what extent the fungus is able to do harm.

To show first that the castor fungus is a new species, it may be stated that it failed to infect tanias (*Colocasia antiquorum*) and the Phytophthora of this latter plant was unable to infect castor seedlings. Evidence of a similar nature showed that there is no relation, as regards parasitism, between the castor species and that which attacks tobacco. Neither can *Ph. parasitica* (the Castor parasite) attack cacao. It can, however, infect tomato seedlings, potato seedlings, wounded areca nuts and other plants commonly attacked by other species of the genus. But, as already pointed out, the observed cultural characters alone were quite sufficient to enable distinction to be made between the castor Phytophthora and those species normally parasitic on the cultivated plants just referred to.

AGRICULTURAL ENGINEERING.

A Self-contained Motor-Plough.—In connexion with the leading article in this issue, the following account of Stock's motor-plough has been abstracted from Dr. Fischer's article in the *Monthly Bulletin of Agricultural Intelligence and of Plant Diseases* (June 1913).

In this article it is stated first that Stock's plough weighs between 4 and 4½ tons. Nearly all the weight is carried by the two driving wheels, thus enabling a grip to be had over the ground.

The wheels are 7 feet 4 inches in diameter, and only 6½ inches wide. Lugs are provided on the wheel tyres to get rid of sticky soil and to prevent skidding, whilst the four-cylinder benzine motor in front, counter-balances the ploughshares with their frame at the back. The steering wheel at the tail of the machine thus bears a very small portion of the weight. Stock's plough is said to have met with great success because it is simple and compact and easily driven. There is a crank for regulating the depth of the shares, levers, close to hand, for driving the motors, and a foot-lever also for throwing the engine into gear. There is no device for reversing or changing the gear, however, which, though increasing the simplicity of the machine, is nevertheless in one way a disadvantage because any alteration in the speed, can only be obtained by changing the gearing, an operation that can be done only when the machine is at rest. Recently, however, the firm of manufacturers has been providing the ploughs with reversing gears, if demanded.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

The Report of Mr. J. R. Jackson is as follows:—

GINGER.

No ginger was offered at the first spice auction on the 4th of the month, but on the 11th 50 bags of rough Cochin were brought forward and bought in at 30*s.* per cwt. On the 18th the large supply of 480 packages of West Indian were offered, and bought in at 65*s.* for extra bold dullish, and 42*s.* to 47*s.* 6*d.* per. cwt. for ordinary to good common. Brown rough Calicut was also bought in at 31*s.* and washed rough Cochin at 29*s.* per cwt. On the 25th the offerings consisted of only 176 bags of fair washed Cochin which were all bought in at 29*s.* per cwt.

NUTMEGS, MACE AND ARROWROOT.

Nutmegs were in large supply at the first auction on the 4th, as many as 406 packages West Indian, were brought forward and sold 67's to 75's fetching 5¼*d* to 6½*d*; 82's to 92's, 5*d.* to 6*d.*; 105's to 115's, 5*d.* to 5¾*d*; and 116's to 125's, 5*d.* to 5½*d.* A week later, namely on the 11th, the offerings amounted to 90 packages West Indian, and 46 packages of Eastern, all of which sold at slightly varying rates from the former. On the 18th, 97 packages of West Indian were also disposed of at equal rates. Of mace, at the first auction on the 4th, 111 packages of West Indian sold at 2*s.* to 2*s.* 6*d.* for ordinary to fair, and 1*s.* 9*d.* to 2*s.* 1*d.* for broken. On the 18th, 30 packages of West Indian were offered and partly sold at 2*s.* 2*d.* to 2*s.* 3*d.*, broken fetching from 1*s.* 9*d.* to 1*s.* 11*d.*, per lb. At the last spice auction on the 25th, no mace was offered. At the first spice auction, on the 4th St. Vincent arrowroot was represented by 163 barrels, 20 of which sold at 3½*d.* per lb.

SARSAPARILLA.

At auction on the 12th of the month the offerings of this drug were as follows:—grey Jamaica 41 bales, Lima Jamaica 29 bales and native Jamaica 5 bales. Of the former 35 bales found buyers at 1*s.* 5*d.* to 1*s.* 7*d.* per lb. for inferior part coarse, and 1*s.* 8*d.* to 1*s.* 9*d.* for fair grey. The 5 bales of native Jamaica realized 10*d.* per lb. for fair palish red, and 8*d.* for ordinary dull. The whole of the Lima Jamaica was bought in. A fortnight later, namely, on the 26th, 36 bales of grey Jamaica, 16 of Lima Jamaica, and 20 of native Jamaica were offered, 18 bales only of the grey Jamaica found buyers at from 1*d.* to 2*d.* per lb. decline on previous prices; 1*s.* 8*d.* to 1*s.* 9*d.* being paid for slightly coarse to fair, and 1*s.* 5*d.* to 1*s.* 7*d.* for dark, part mouldy and damaged. None of the Lima Jamaica was sold, and only bales out of the 20 offered of native Jamaica, and this was disposed of at a reduction of from 1*d.* to 2*d.* per lb. on previous prices.

LIME JUICE, LIME OIL, TAMARINDS, KOLA, CANELLA ALBA AND CASSIA FISTULA.

At the beginning of the month West India raw lime juice was quoted at 1*s.* 6*d.* for ordinary, to 1*s.* 9*d.* per gallon for good. In the week ending June 21, there was a brisker demand, and 1*s.* 4*d.* to 1*s.* 10*d.* was asked for ordinary to pale. Hand pressed lime oil was quoted in the early part of the month at 14*s.* and for distilled 1*s.* 8*d.* A week later 1*s.* 10*d.* to 2*s.* was demanded for distilled and 14*s.* 6*d.* for hand pressed. In the week ending June 21 a further advance was made, 2*s.* 6*d.* being paid for West Indian distilled, and at the close of the month 2*s.* 9*d.* per lb. was obtained, and a case of hand pressed realized 15*s.* per lb. Tamarinds have been in steady demand. In the middle of the month 12 packages of new crop pale, from Montserrat sold at 14*s.* per cwt. New crop Antigua, of fair average quality, were quoted at 15s. to 15*s.* 6*d.*, and Barbados in bond at 17*s.* 6*d.*; at the end of the month a consignment of 9 barrels from Antigua, fair dry, fetched 14*s.* per cwt., at the same auction some fair juicy Barbados were offered at 17*s.* It was reported in the middle of the month that a consignment of African kola had arrived at Liverpool and that sales had been made at from 2½*d.* to 3*d.* per lb. At the last auction in London on the 26th, 35 bags from Ceylon were offered, and 22 sold at 4¾*a.* to 5*d.* per lb. for small to medium dried. At the drug auction on the 12th a consignment of 8 bales of Canella alba bark was brought forward and sold at from 47*s.* to 50*s.* per cwt., for small to bold palish quill At the same auction 59 packages of West Indian Cassia Fistula were offered only 6 of which found buyers at 15*s.* per cwt.

MARKET REPORTS.

London.—The West India Committee Circular, July 15, 1913; Messrs E. A. de Pass & Co., July 4, 1913.

Arrowroot—3d. to 4⅞d.
Balata—Sheet, 2/9; block, 2/1½ per lb.
Beeswax—£8 5s. to £8 7s. 6d.
Cacao—Trinidad, 71/- to 78/- per cwt.; Grenada, 65/- to 70/6; Jamaica, 64/ to 72/-.
Coffee—Jamaica, 5[illegible]
Copra—West Indian, £31 per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 14d. to 24d.
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet. 37/- to 62/-.
Isinglass—No quotations.
Honey—31/- to 40/-.
Lime Juice—Raw, 2/8; concentrated, £25; otto of limes (hand-pressed), 15/.
Logwood—No quotations.
Mace—1/11 to 2/6.
Nutmegs—4½d. to 4¾d.
Pimento—Quiet. 2½d. to 2⅜d.
Rubber—Para, fine hard, 3/9; fine soft, 3/5; Castilloa, 2/6 per lb.
Rum—Jamaica, 2/4½ to 5/- per gallon.

New York.—Messrs. Gillespie Bros. & Co., July 11, 1913.

Cacao—Caracas, 14¼c. to 15c.; Grenada, 14c. to 14½c; Trinidad, 14¼c. to 14½c.; Jamaica, 12c. to 14c.
Coco-nuts—Trinidad and Jamaica, selects, $38·00 to $40·00; culls, $24·00 to $25·00 per M.
Coffee—Jamaica, 9½c. to 12½c. per lb.
Ginger—7½c. to 10½c. per lb.
Goat Skins—Jamaica, 50c.; Antigua and Barbados, 48c. to 50c.; St. Thomas and St. Kitts, 44c. to 46c. per lb.
Grape Fruit—Jamaica, $2·00 to $4·00
Limes—$6·00 to $6·50
Mace—42c. to 48c. per lb.
Nutmegs—110's, 12½c.
Oranges—Jamaica, $2·75 to $3·00 per box.
Pimento—4½c. per lb.
Sugar—Centrifugals, 96°, [illegible] per lb.; Muscovados, 89°, 2·98c.; Molasses, 89°, 2·73c. per lb., all duty paid.

Trinidad,—Messrs. Gordon, Grant & Co., July 21, 1913.

Cacao—Venezuelan, $14·00 to $14·25 per fanega; Trinidad, $13·75 to $14·10.
Coco-nut Oil—$1·25 per Imperial gallon.
Coffee—Venezuelan, 15c. to 15½c. per lb.
Copra—$4·90 per 100 lb.
Dhal—$4·75 to $5·00
Onions—$1·50c. to $2·00 per 100 lb.
Peas, Split—$6·20 to $6·25 per bag.
Potatoes—English, $1·90 to $2·20 per 100 lb.
Rice—Yellow, $5·40 to $5·50; White, $5·50 to $5·75 per bag.
Sugar—American crushed, no quotations.

Barbados,—Messrs. James A. Lynch & Co., Ltd., July 12, 1913; Messrs. T. S. Garraway & Co., July 5, 1913; Messrs. Leacock & Co., July 4, 1913.

Arrowroot—$6·00 to $7·00 per 100 lb.
Cacao—$14·00 per 100 lb.
Coco-nuts—$18·00
Hay—$1·50 per 100 lb.
Manures—Nitrate of soda, $70·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $82·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$2·00 to $3·00 per 100 lb.
Peas, Split—$5·50 to $6·00 per bag of 210 lb.; Canada, $3·85 to $4·00 per bag of 120 lb.
Potatoes—Nova Scotia, $2·50 to $4·50 per 160 lb.
Rice—Ballam, $5·05 to $5·40 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $3·75 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, July 19, 1913; Messrs. Sandbach, Parker & Co., July 18, 1913.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	8c. per lb.	——
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	——
Cacao—Native	12c. per lb.	13c. per lb.
Cassava—	60c.	——
Cassava Starch—	$5·00 to $6·00	——
Coco-nuts—	$16 to $20 per M.	$10 to $16 per M.
Coffee—Creole	16c. per lb.	18c. per lb.
Jamaica and Rio	16c. per lb.	18c. per lb.
Liberian	13½c. to 14c. per lb.	14c. per lb.
Dhal—	$4·50 to $4·75 per bag of 168 lb.	$5·00 per bag of 168 lb.
Green Dhal	$5·50	——
Eddoes—	$1·32	——
Molasses—Yellow	None	——
Onions—Teneriffe	3½c.	4c.
Madeira	5c.	5c.
Peas—Split	$6·25 per bag (210 lb.)	$6·50 to $7·00 per bag (210 lb.)
Marseilles	——	——
Plantains—	10c. to 32c.	——
Potatoes—Nova Scotia	$2·50 to $2·75	$3·00
Lisbon	——	$1·40 to $1·50
Potatoes-Sweet, B'bados	$1·44 to $1·68 per bag	——
Rice—Ballam	No quotation	——
Creole	$4·75 to $5·00	$5·00
Tannias—	$1·56	——
Yams—White	$3·00	——
Buck	$1·92	——
Sugar—Dark crystals	$2·15 to $2·20	$2·10
Yellow	$2·50 to $2·60	$2·40
White	$3·75 to $4·00	$4·00
Molasses	$2·00	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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Control of the Milk Supply in Small Communities.

IT is doubtful whether those writers who were responsible for the creation of a romantic side to the milking of the domestic cow would have written in such eulogistic terms had they been able to predict the sordid circumstances that must surround the operation when towns grew up and rural districts became thickly populated. The conception of the idealistic dairymaid and the perfect cow has been shorn of all romance by co-operative methods and chemical control, so much so that in well-organized industrial centres the idea of associating milk with its source of origin is almost as unusual as a pound of sugar suggesting a clump of canes or a field of beet roots. This, however, is merely sentiment, for the modern industrial organization and inspection of milk supply ensures a safer and even more constant grade of article than that on the farm itself. In the case of the small producer in crowded communities, on the other hand, a very different state of affairs exists; for whilst co-operative concerns give rise, from the public health point of view, to considerable commendation, the small producer—the owner of a cow or two, and the street huckster—gives cause for grave dissatisfaction.

Although adulteration is frequently practised even in places where the machinery of the law is efficient, it is by no means entirely the intentional, the criminal tampering with milk that is to be deprecated. There is another side to a defective milk supply, the objectional features of which are due to the ignorance and carelessness of the vendor. Hence in the regulation of milk supply not only must there be legislation stringently executed, but there must also be education accompanied, if possible, by some means of encouragement to convince the cow-keeper that it is a national duty and commercially worth while to produce the best possible grade. Although what follows deals mainly with the ways and means of controlling milk supply this aspect regarding education and encouragement must not be lost sight of.

From time to time, reports on instances of milk adulteration come before the public eye. They may frequently be observed in the form of prosecution cases in European and American publications. Strangely enough, the West Indies can boast of being remarkably free from any such defamatory advertisement, in spite of a large consumption of milk and in spite of a big production of ordinances. Hence the recent revelations in the Leeward Islands have caused considerable consternation. It would appear from reports that have recently been issued that practically all the milk sold in Antigua and St. Kitts by street hucksters is watered—and there is every reason to believe that this adulteration has been practised for many years past. Furthermore, the quality of the milk supplied by contract to public institutions is open to grave suspicion. The above announcement relates only to the chemical composition of the milk: there is reason to believe also that the methods adopted in the disposal of the produce are insanitary in these islands, and the frequent outbreaks of typhoid fever do not tend to allay public anxiety in this direction. Except in the case of one or two of the larger islands—though even in these the methods of disposal of milk are open to criticism—there exists in all probability, in the West Indies, a large amount of undetected adulteration and pollution, although a degree of personal safety is ensured by the common practice of boiling. At the same time it appears to be becoming urgently necessary for the establishment of a definite organization of control.

It is to be feared that, outside ecclesiastical realms, the laying down of a rule or a law is, by itself, insufficient. There must be thorough execution. In the present case of milk supply—and the same holds good for meat supply—there are several features which render the execution of the law unfit for untrained officers, for the duties are, to a large extent, of a technical nature. On the other hand, small communities are under a disadvantage, in that the duties of milk and meat inspection are not of a sufficiently extensive nature to justify the appointment of special officers. It follows therefore that these duties, if they are to be performed, must be amalgamated with others. Speaking generally, there are four kinds of professional men who are adequately trained to undertake or to direct food inspection: medical men, chemists, bacteriologists and veterinarians. Medical men, as a rule, unless holding a consulting appointment or restricted to laboratory work at hospitals, are not in a position to undertake routine work of this nature; in small islands their duties are too general, and their times too uncertain, for such work. Chemists, or bacteriologists, if they be available might possibly undertake the duties, but more often than not they are unavailable, the extreme technical nature of their work and the expensive equipment which it demands tending to limit their employment in the public service. There remains then the veterinary surgeon.

It would seem that in the smaller colonies, where no action has as yet been taken, the milk and meat supply might conveniently and economically be placed under the general inspection of a properly qualified veterinary officer. The services, too, of this officer in connexion with the importation and exportation of live stock, his advice in regard to breeding and selection, and to the administration of legislation in regard to contagious diseases together with general practitioner work as permitted by circumstances would all seem to meet the existing local requirements. The feasibility of such an arrangement is not lessened when we come to consider in detail the duties involved.

Although there would be some variation in different places according to the provisions of legislation, in general the work of milk inspection ought to come under two distinct heads: (1) milk production, (2) milk supply. The latter constitutes that side of the industry on which most deliberate fraud takes place, but harm can also accrue from milk production, that is to say, originate in the cows themselves. An animal may be a yielder of low quality milk, and under a stringent statute the sale of the produce of this cow would not be permitted, though it might, of course, and always is in temperate countries, mixed with the very rich milk of better breeds. On the other hand, if this cow giving milk of low quality happens to be tuberculous, the mixing leads to the wide distribution of the microbes of disease. Tuberculous cows should not be milked at all. But before any action could be taken in such matters as these, technical skill must be available first. Similar requirements exist in connexion with the supply of milk. Here we have to face both adulteration, and contamination. Adulteration can be detected by simple chemical processes—nowadays, mechanically, so that even the cow-keeper himself can test the milk; but it cannot be too strongly emphasized, in passing, that the casual employment of the somewhat abused lactometer by private individuals is valueless for anything like critical work. For one thing, it is not possible to tell definitely by means of this instrument whether milk has been watered or not. The specific gravity of fat is lower than that of water, and if some of this fat is removed and a proportionate amount of water added in its place, the lactometer will still show milk of good quality, apparently unadulterated. It is known from unpublished investigations that even intelligent fraud of this sort has been practised in St. Kitts.

Contamination or pollution is the worst feature of a bad milk-supply, and it is in this direction that the veterinary officer, chemist or medical man as a bacteriologist should give careful attention. As in the case of the chemical examination of milk, so in the biological, certain simple and quick tests have been invented, one of the most useful being the Gär-reductase test, which depends on the fact that if a certain colouring matter is added to a sample of milk, discoloration gradually takes place, the rate depending upon the number of germs originally present in the sample. An officer in charge of milk supply would, however, investigate further than this and endeavour to detect any specific disease bacteria in suspected samples.

The administrative side of the subject of the control of milk supply must be left to the local authorities. Undoubtedly the registration of milk vendors is imperative. But that alone will not safeguard the public. Individual energy backed by technical training must move hand in hand with legislation. What has been already said will serve to indicate the necessity for this control, the proper person under different circumstances to carry it out, and the lines of work to be followed. It remains for those in authority to consider the necessary expenditure, and to take the initiative and start the machinery in motion.

THE EFFECT OF COMMON SALT ON THE GROWTH OF SUGAR-CANE.

The island of Porto Rico has, in proportion to its size, a considerable area of swamp and marsh land. The object of the researches which Bulletin No. 4 of the Experiment Station of the Sugar Producers' Association describes, was to find out what means exist to make these salt marshes produce cane at a profit.

The most important point on which a definite decision was necessary, was the exact limit of the cane plant for salt. As regards the effect of salts in general on the growth of plants, sodium carbonate is the most toxic; sodium chloride, sodium bicarbonate and magnesium chloride are less so. Sodium sulphate and magnesium sulphate are still less harmful, whilst calcium salts are least toxic of all. It is said on the authority of Maxwell, that, in ordinary soils, a percentage of sodium chloride exceeding 0·15 per cent. (0·09 per cent. of chlorine) will prevent a normal growth of cane. In soils which are well provided with nitrogen, the chlorine content may go higher than 0·15 per cent. of sodium chloride without causing any harm. If the chlorine is combined mainly with calcium, it may reach higher figures than 0·09 per cent. In Hawaii, it is concluded by Echart, that if the salt content of the soil reaches over 0·1 per cent. an injurious effect is produced on the cane. It appears that cane, in its later stages of growth, may stand a much higher quantity of salt without visible injury. It may further be mentioned in connexion with the point under discussion, that in Jamaica, Barbados, Trinidad and Demerara, an occasional flooding with sea-water, or the application of sodium chloride to certain fields has been found actually beneficial. This fact is explained by Prinsen Geerligs by the principle that a treatment with sodium chloride renders the potash, lime and magnesia contained in the soil more available.

With more particular reference to the conditions of the Porto Rican experiments, the chief difficulty in gauging the total effect of the salt content of the marshes was that the effect of the different salts was not simply additive but rather interactionary. That is to say, one salt may intensify the action of others, whereas another one may lessen it. Thus sulphates in general will mitigate the effects of carbonates, bicarbonates and chlorides, and calcium salts in general will counteract the influence of those of sodium and magnesium. For this reason it was found very difficult to interpret the results of analyses. Nevertheless by collecting parallel observations on the condition of the cane crops and the composition of the soil of different fields, it was seen at once that a very striking relation existed between the salt content of the soil and the general condition of the cane grown on it. To give but two examples: an area which contained only ·011 per cent. chlorine, produced as much as 60 tons of cane per acre, whereas another containing ·188 per cent. chlorine, yielded only 20 tons per acre. Not only does salt, when present in large quantities, lower the yield obtained, but, as is shown by a table in the bulletin, it affects the composition in a most deleterious manner.

As already indicated, the application of lime greatly improves saline soils, as does also the application of nitrogen in the form of dried blood. But the conclusion of the bulletin which is emphasized most, is the necessity for lowering the water level of these soils by drainage. Such methods are in progress, and are likely to be extended. The idea is that good drainage will lower the salt-water level, and enable the excess of salt in the soil to be washed out by natural rainfall, or, if necessary, by the aid of irrigation, until the concentration of the salts falls below the danger point, as indicated by the results described in the bulletin under consideration.

Composition of Soil Suitable for Rubber Cultivation.—The Director of the Agricultural Institute of the University of Halle, has investigated rubber soils from Brazil and German East Africa. An interesting abstract of his conclusions are given in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (January 1913) from which the following notes are taken.

In comparing the fertility of the soils of the two places, it must be remembered that the annual rainfall in South America is something like 120 inches, whilst in German East Africa it amounts only to about 80 inches. The higher rainfall is believed to render the nutritive substances more easily assimilated. Apart from this consideration, *Hevea brasiliensis* is cultivated in South America, whilst the *Manihot Glaziovii*, which requires a dry climate, is grown in East Africa. Nevertheless, it is believed that generalizations, holding good for East Africa and South America in regard to the soil requirments for rubber producing trees can be formulated from the observations made. These conclusions may be expressed as follows: (1) The soil should be fine, of medium coherence, rather loose than heavy, and deep; (2) it is not necessary that the nitrogen content should be higher than 0·1 per cent., whilst a large percentage of humus was found to be actually injurious; (3) lime and magnesia are needed only in very limited amounts; (4) the rubber tree appears to have no special requirements as regards the phosphoric content of the soil; (5) it would seem that a large amount of potash in the soil promotes growth and the formation of latex.

FRUITS AND FRUIT TREES.

COHUNE NUTS FROM BRITISH HONDURAS.

An article on the above subject, appearing in a recent issue of the *Bulletin of the Imperial Institute* (April-June 1913), is of particular interest in connexion with a report published in the *Agricultural News* (Vol. XII, p. 180), describing similar investigations by the Imperial Institute into the commercial value of gru-gru nuts.

Cohune nuts are borne in large bunches, and each tree is said to yield 1,000 to 2,000 nuts per annum. The kernels are rich in oil; but so far they have not been utilized on a commercial scale, chiefly owing to the difficulty of cracking the very hard shells which surround them.

An examination of different samples showed that the cohune kernel fat resembles very closely both coco-nut oil and palm kernel oil, but it is generally of somewhat softer consistency. Since the oil of the gru-gru nut is stated to resemble closely palm kernel fat, it would appear to follow that the cohune nut fat resembles the gru-gru nut fat.

An interesting feature connected with the cohune nut is the existence of a fibrous layer, which contains from about 9 to 20 per cent. of fat. The possibility of utilizing the oil in this tissue in British Honduras would only be feasible if a plant for the extraction of fat by solvents were installed. As regards their purely economic characters, it is stated that if cohune kernels were shipped to Europe in commercial quantities, they should realize prices approximating to those of copra, the present price of which is about £30 per ton (April 1913). Also the fat of the cohune kernel should be worth about the same price as palm kernel oil or coco-nut oil, the present values of which in the United Kingdom are as follows: coco-nut oil from £43 5*s*. to £50 10*s*. per ton, and palm kernel oil about £42 15*s*. per ton (April 1913).

Citrus Cultivation in Italy.—Useful data on the cultivation of citrus fruit in the Province of Salerno are presented in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (May 1913). It is stated in this that in the Nocera district, the best citrus fruit groves are let at rents reaching to £32 per acre. Oranges and tangerines are cultivated most; they are planted in alternate rows, at the rate of about 240 trees per acre, and they are often interplanted with walnuts (thirty-two to forty per acre). The varieties of orange which incur the greatest favour are the flattened orange (*Citrus Aurantium depressum*, Risso), the pear-shaped orange (*C. Aurantium ellipticum*, Risso), the Maltese, and the blood orange. New York and England constitute the chief markets for lemons; two-thirds of the oranges and tangerines produced, are consumed in Italy; the rest are sent chiefly to Austria-Hungary. The price of tangerines ranges from 6*s*. to 12*s*. per cwt., that of oranges from 2*s*. 10*d*. to 4*s* per cwt., during December to March, and from 7*s*. 3*d*. or 8*s*. to 12*s*. and 16*s*. per cwt. in the summer. The Nocera harvest lasts from December to August.

Fruit Growing in Tunis.—The following note has been translated from the *Bulletin de la Société Belge d'Etude Coloniale* (June 1913).

Although fruit cultivation and market-gardening constitute, in Tunis, industries of secondary importance, considerable areas of land are nevertheless planted with almonds, lemons, oranges, figs and dates. In regard to almond cultivation, it is the practice to plant sixty-nine trees per hectare (about 2½ acres), leaving a space of 12 metres (about 40 feet) between the trunks. In years of good harvest, 1 acre is supposed to bring in a return of 345 francs (about £14), which is about 5 francs per tree. This is rather greater than the income derived from lemons, which is stated to be from 200 francs (£8) to 300 francs (£12) per hectare

In connexion with the cultivation of oranges and tangerines, it is stated that these are mainly consumed locally: such slight exports as do occur take place principally during December and January.

Bonuses for Coco-nut Cultivation.—According to *The Board of Trade Journal* (June 26, 1913), the Brazilian Minister of Agriculture has entered into a contract with a view to encouraging the systematic cultivation of coco-nut palms and the exportation of copra. Certain bounties are to be granted provided certain conditions are adhered to, among which are the following: A report giving full details as to cultivation must be presented at the end of the first year; and a copra factory must be established within two years to deal with the produce of at least 7,410 acres. The Minister of Agriculture will endeavour to obtain duty free admission of all machinery, and will also grant a premium up to a maximum amount of £2,000 per annum on the copra and coco-nut oil exported.

AGRICULTURAL ENGINEERING.

TRACTORS FOR THE TROPICS.

An announcement, in French, has just been issued by the Belgian Minister for the Colonies to the effect that an international trial of tractors and other appliances answering the purposes of mechanical labour will take place at Chassart (Brabant) towards the end of September 1913. It is explained in the booklet, which has been received at this Office, that the objects of the trial are as follows. Steam engines have been employed since 1911 by the agricultural service in the Belgian Congo (Katanga) for clearing land and for transport purposes in regions where native manual labour is rare or costly, and in the zones where the tsetse fly prohibits the employment of draft animals. It is stated that these mechanical means having given excellent results, the Minister for the Colonies has decided to increase the number of machines used for clearing land in Katanga, and to introduce tractors into other districts of the colony. The leading societies of the Belgian Colonies have recently shown their intention to have recourse to the same action in order to extend important plantations in the lower Congo and at Kasai. It is maintained that these projects demonstrate the usefulness of a competition where the numerous modern appliances, in principle and in construction very dissimilar, will be subjected to deliberate trial organized and judged by competent engineers.

The Minister for the Colonies will invite, officially, foreign Governments, and especially those of the Colonies, to take part in the international meeting by sending delegates from the various agricultural departments.

The trials will include the testing under practical conditions of five different classes of machines: (1) ordinary steam tractors; (2) benzene tractors worked by an internal combustion engine; (3) tractors provided with a cable arrangement for hauling ploughs across the field; (4) automatic ploughs, that is to say, machines carrying on the motor-chassis, the body of the plough; (5) machines carrying on the motor chassis, implements which may be put into motion by the motor.

Each machine will have to work during two days of eight hours each. As regards ploughing, the soil will have to be worked to a depth of from 20 to 22 cm. The earth where the trials are to be made is easy to work. In connexion with traction on the roads, the trials will be made along a country lane in bad condition.

The booklet gives a large amount of further information including the score card used for awarding points, and not the least interesting feature of the publication is the large number of excellent photographs, which show in many instances the machines at work under wild conditions in West Africa.

Extinguishing Fires with Sawdust.—The results of experiments have been recorded on the use of sawdust and mixtures of sawdust and sodium bicarbonate for extinguishing fires, especially those of inflammable liquids. Three tanks were used in these tests, the flaming liquids being lacquer and gasolene, and the sawdust being applied by means of an ordinary long-handled shovel.

It was found that sawdust, if spread over the surface, will readily and successfully extinguish fires of inflammable liquids when contained in moderate sized tanks or spread in small quantities on floors. The efficiency of sawdust is due to its blanketing action excluding air, and increases with the viscosity of the liquids. The character of the sawdust, whether wet or dry or from soft or hard wood, apparently does not affect its efficiency, but the admixture of sodium bicarbonate materially increases it. (*Experiment Station Record*, for June 1913.)

A Self-Propelled Portable Elevator.—The *Louisiana Planter* (July 5, 1913) describes an arrangement designed by an American firm for handling sacks of raw sugar weighing from 300 to 350 ℔. There are two types of machines, the 'Cuban' for handling the sacks at the plantation warehouse, and the 'American' for dealing with the same sacks in the storage warehouses of the American refinery.

The machines are built entirely of steel, strongly and heavily constructed to withstand strain and rough usage. They are provided with electric, gasolene, alcohol, steam or compressed air power, as may be desired by the purchaser. Each machine is provided with a steel chute that may be quickly and easily attached to the top of the upper carrier for use when it is required to place the bags some distance back on the pile, thus eliminating the heavy work of placing them by hand.

The speed of the carriages is about 50 feet per minute, which gives a capacity of over 500 bags or about 80 tons, per hour, with the assistance of ten or eleven men loading and operating the machine and placing the bags in position.

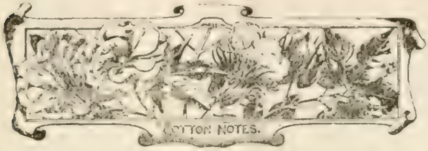
Another firm has invented a machine of a similar type which is a combined elevator, conveyor and unloader. It is built in different sizes ranging in capacity from 1 to 3 tons per minute and elevating to a height of from 15 to 35 feet or more.

Agricultural Implements in Japan.—In comparison with other countries, the standard of agricultural implements used in Japan is remarkably low. A writer in the *Journal of the Royal Society of Arts* (July 4, 1913), after describing the different primitive implements already in use, makes certain suggestions which are here briefly noted.

It is advocated that the use of farm animals should be increased in the place of human labour. In regard to the ploughing of dry soils, the introduction of the vineyard type of plough is advocated, and the necessity for special implements for the cultivation of wet fields is referred to.

There are several changes taking place in Japan which are likely to bring about the employment of motor power in cultivation, namely, the concentration of labour in the rising industrial centres, and the straightening out of the old irregular boundaries between the fields, and the re-allotment of land.

Automatic Recording Juice Scale.—According to the *American Sugar Industry* (July 19, 1913), an accurate automatic weighing and recording machine for such heavy flowing and foaming materials as raw sugar juices, molasses and the like has recently been invented. It is stated that this scale has been used in practice at a sugar factory at Dormagen, Germany, and that the greatest variations in accuracy are never greater than ·02 of 1 per cent. If desired, this machine is also provided with a patent remainder attachment, which is an arrangement whereby the automatic weighing mechanism is thrown out of gear and any amount from zero to the capacity of the scale—which varies according to the size of the machine from 100 to 8,800 ℔—may be accurately weighed. This additional weight, however, is not recorded on the counter, and must be added to the gross amount shown.


COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date July 26, with reference to the sales of West Indian Sea Island cotton:—

Since our last report about 100 bales of St. Vincent cotton have been sold; these include the best qualities, chiefly from 24*d.* to 28*d.*, and Stains from 12½*d.* to 17½*d.* Holders are rather pressing sales and buyers, having no immediate requirements, are only purchasing to stock on distinct concessions.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending July 26, is as follows:—

The market remains dull, without any sales, and we can only repeat out last quotations.

We quote, viz.:

Extra Fine	28c. to 29c.	= 16*d.* to 16½*d.*	c.i.f., & 5 per cent.
Fully Fine	26c. to 27c.	= 14¾*d.* to 15¼*d.*	„ „ „ „
Fine	25c.	= 14¼*d.*	„ „ „ „
Extra Fine off in preparation	24c. to 26c.	= 13½*d.* to 14½*d.*	„ „ „ „
Fully Fine off in preparation	22c.	= 12½*d.*	„ „ „ „
Fine off in preparation	20c.	= 11½*d.*	„ „ „ „

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to July 26, 1913, were 2,977 bales, 7,381 bales, and 4,770 bales, respectively.

COTTON IN EGYPT.

In continuation from the last issue of the *Agricultural News*, of this abstract of a paper written by the Superintendent of the Royal Botanic Gardens, Peradeniya, Ceylon, the following information concerning insects pests and various economic matters should prove of equal interest.

INSECT PESTS.

The existence of insect pests is said to constitute the great danger to Egypt's cotton. Firstly, there is the cotton worm, which makes its appearance in the early stages and devours all the young leaves. The difficulty in combating this pest is that the caterpillar lives on the clover during the winter, and the clover is absolutely essential to the fellah for feeding his cattle during the winter months when no other green fodder is available—thus the supply of caterpillars from this source cannot be cut off. The picking off and burning of the insects or the eggs deposited on the leaves is, so far, the only successful measure adopted.

The next most serious pest is the boll worm, and this is still more difficult to deal with, inasmuch as it is not so conspicuous an insect as the cotton worm. There are also several minor pests such as the aphis and the cut worm.

Against all these pests the Government are said to be taking the most energetic preventive measures. There has been an awakening to the existence of that most important factor provided by nature for reducing insect pests, namely, the work of insectivorous birds. The protection of these avian benefactors is a thing all tropical countries should look to, before it is too late [*] It has been remarked that it is only within the last few years, following the almost complete extinction of the species of native insectivorous bird (the white egret or crane) said to have been particularly partial to the chrysalis of the cotton worm, that this insect has obtained its present dangerous magnitude. Hence the Egyptian Government have issued stringent laws which are published and placarded in every public place, protecting not only egrets, but every insectivorous bird, such as larks, plover, bee-eaters, wood-peckers, etc., and have established breeding depots for the egrets.

DISPOSAL OF CROPS.

Most of the cotton crops belonging to the large proprietors is bought as it stands by the big cotton firms—English, Grecian and German; but the small landowners sell their cotton in the villages to native or Greek merchants, who in turn transport it in big sacks containing 300 lb. by camel, cart and canal boat to the various ginneries owned by Greeks and natives, which are scattered all about the country.

EGYPTIAN COTTON DETERIORATING.

The deputation of the World's Cotton Spinners which visited Egypt lately, are said to have been very impressed by the advanced methods of cultivation in vogue, but pointed out that Egypian cotton was undoubtedly deteriorating, owing partly to soil exhaustion, and partly to the fact that not enough attention is paid to keeping up the standard of seed. To this the cultivators replied, that if the buyers would pay a higher price, they (the cultivators) would expend more time and money in correcting these faults.

Recent Interesting Announcements.—A letter has been received from the Chief Secretary to the Royal Society for the Prevention of Cruelty to Animals, in which it is announced that the Council has decided to offer a prize of £100 for the most practical and useful type of horse shoe that will provide the animal with a satisfactory footing upon roadways. The merits of the competing devices will be judged mainly on the provision of a satisfactory and non-slipping foothold, the reduction in the amount of damage caused to roads, and the general practicability of a shoe capable of general manufacture, reasonable life, moderate cost and similar considerations. Particulars may be obtained from the Chief Secretary of the Society at 105 Jermyn Street, London, S.W.

A letter has also been received in which information is presented regarding the Kentia palm seed industry. It is announced that the Government of New South Wales has now taken over the management and the control of the industry, and it is now free from that monopoly and unsettled condition which existed previously, and which was calculated to deter English and continental nurserymen and others from sending orders to agents located in Australia.

A further communication of interest is one from the British South Africa Co. in which it is stated that a shipment of wool from Rhodesia was offered during May for sale in the public auction room, and, in spite of competition, sold at good prices.

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[*] Considerable attention has recently been given to this question in British Guiana. See Insect Notes in current issue p. 266. [Ed. *A.N.*]

VETERINARY NOTES.

THE UNITED STATES INSPECTION AND QUARANTINE SERVICE.

The extensive nature, and the thorough organization of the United States Quarantine Service are rendered evident in a Circular (No. 213) issued recently by the Bureau of Animal Industry.

After dealing with the provisions of laws and regulations, the paper proceeds to the subject of permits and other safeguards. An important feature in preventing the importation of the infection of animal diseases from foreign countries is the requirement relative to the obtaining of permits from the Secretary of Agriculture. These are issued in triplicate: two copies are sent to the owner or his agent, one of them being addressed to the United States Consul at the foreign port of shipment, and the other to the Collector of Customs at the United States port of entry

In continuation, the question of quarantine is dealt with next. For cattle coming from Great Britain, Ireland and the Channel Islands, the period of confinement is thirty days; for animals from other places the time varies according to circumstances The stringent regulations in this respect, with regard to Great Britain and Europe in general, appears to be due to the inability in Europe to control adequately foot and mouth disease.

From the West Indian aspect, the most interesting section of the paper is that which describes instances of suppression and exclusion of contagious diseases from abroad. In view of the fact that the United States possesses every kind of climate, the danger of the introduction of animal diseases from the Tropics and sub-tropics has been early recognized. In 1901, legislation was passed in regard to the Philippines. During 1906 serra was found in an importation of Zebu cattle shipped from Bombay, but it was not allowed to escape from the quarantine.

Another interesting case connected with the importation of Zebu cattle was that in relation to a landowner's suggested introduction into Texas of some fifty head of these animals. At first the Government refused to permit the importation under any conditions. Eventually it was agreed to, that, under the continuous inspection of a Department's veterinary officer, the desired transfer from India might be carried out. An officer proceeded to Bombay with the buyer of the animals, and after selecting animals from sections reported to be free from disease, the cattle were subjected to blood tests and kept under aseptic conditions during every stage of the voyage from the East to New York. Until their arrival at the American port, where they were placed in quarantine, no parasites had been detected in the blood; within a short time, however, surra was found in three of the animals. Not until after five months under screens were thirty-three animals released and shipped to their destination in Texas. Eighteen out of the original herd of fifty-one had been destroyed because of the appearance of the disease in their blood.

One of the most important matters relating to animal importations into America is the sterilization of hides and skins. These commodities are subject to the same law that governs the importation of cattle. Up to the present, no absolutely satisfactory means has been devised for the sterilization of infected hides, particularly those containing anthrax spores. It is stated that green or sun-dried hides immersed for thirty minutes in a 1 in 1,000 solution of bichloride of mercury, are seriously injured (see *Agricultural News*, Vol. XII, p. 247). The Bureau of Animal Industry, however, is making investigations of means for the sterilization of anthrax spores or germs in hides, skins, hair, wool, etc., in order that they may be safely rendered sterile without any injury or depreciation of their value

Lastly, a few facts may be added in regard to the American inspection of live stock for export. Animals intended for shipment are given a veterinary inspection, in order to guard against the exportation of disease, and to conform with the requirements of certain Foreign Governments. The Bureau also inspects vessels that carry such animals, and enforces regulations as to fittings, feed, water and attendance, so as to ensure that the animals will be carried in a safe and humane manner, and reach the other side in good condition.

It may be noted in conclusion, that, although regulations exist which provide that no animals shall be exported from the United States to any foreign country unless they have been inspected and found free from disease, this requirement is waived in regard to Cuba, the West Indies, Mexico, Central America, and the countries of South America, excepting Argentina and Uruguay.

FECUNDITY IN FOWLS.

The manner in which the Board of Agriculture of England presents, in its Journal (for June 1913), the results of Dr. Raymond Pearl's remarkable investigations is as admirable, in its way, as the results themselves are interesting and economically important.

Divested of all technicalities, the article shows the practical man clearly and concisely that, the principal agent in transmitting fecundity (laying capacity) in fowls is the male bird, and that selection of cocks must be practised, as well as selection of hens, in building up the desired strains of high fecundity fowls.

In the investigation, winter egg-production, because the capacity of strains varies most during this period, was adopted as a measure of fecundity, and it was found that hens can be placed in three distinct classes: (a) those laying no eggs whatever during the winter period, (b) those laying under thirty eggs, and (c) those laying over thirty eggs.

Independent of any Mendelian theory or phraseology which may be framed to account for his observations, Dr. Pearl actually found that hens of high productivity were unable (when mated with certain cocks) to transmit their qualities to their daughters. On the other hand, he discovered that hens of the thirty and over class, if mated with certain other cocks, gave sometimes all highly productive daughters, and, sometimes, partly high producers and partly low producers. Again, he found that if certain cocks were mated with hens of zero, or low producing capacity, all the daughters produced thirty eggs and over.

As a guide to the practical application of these results, the writer of the article in question says:—

'The main desideratum is to produce the cock which invariably gets daughters of high fecundity; to do so, the high fecundity hen must be found by selection; she will transmit her desirable character through her sons, but only in certain cases will all these sons be of the highest quality. If all are of the highest quality (that is, invariably getting high fecundity daughters, however mated), then their *father* is the male wanted. But if, as is more likely, the sons differ, each must be tested by mating, with a view to ascertaining what his quality is. This testing should be done, preferably, *with zero hens*, for if the male is not of the highest class he will, when mated with such hens, get daughters of low fecundity.'

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the subject of the control of milk supply. It serves to indicate the necessity for control in the West Indies, the proper person under given circumstances to carry it out, and the lines of work to be followed.

Under the heading of Agricultural Engineering, on page 261, will be found an account of a forthcoming exhibition of tractors to be held in Brabant, Belgium, towards the end of September 1913.

The successful nature of the work of the United States Inspection and Quarantine Service is dealt with in an article on page 263. Laying capacity in fowls is also considered on this page.

Under the caption Insect Notes, on page 266, will be found a useful account of recent work on sugar-cane pests in British Guiana. The subject of cacao thrips in Florida is also dealt with.

On page 267, the last Annual Report on the Experiment Station, Tortola, is briefly reviewed, and consideration is likewise given to the recently published report on agricultural progress in India, 1911-12.

The Philippine College of Agriculture is described under Students' Corner on page 269.

Fungus Notes, on page 270, include a short account of recent French work on diseases of Hevea and cacao.

Trade Products of the British Empire.

It may be stated without hesitation that the Special Supplement to the *Chamber of Commerce Journal* for July 1913, is a publication which will be found of the greatest use and interest to manufacturer and agriculturist alike. More especially will it prove instructive to the planter and estate-owner in the Tropics, for it gives statistical accounts of the resources of the British Empire as a supplier of foodstuffs and of raw materials for British industries.

In this brief notice it will not be possible to do more than make reference shortly to those facts presented which relate to the West Indies in particular.

The West Indies, as regards area, form a very small part of the British Empire, and important markets for many of its products are centred in Canada and the United States. Nevertheless in the Supplement under consideration we find first of all under the heading of Arrowroot, the following statement: 'The imports of arrowroot to the United Kingdom in 1912 were 28,941 cwt., valued at £49,152 of which 28,363, cwt. valued at £47,122 came from the West Indies.' The greater part of this quantity was produced in St. Vincent. Again under the heading of Coffee, the West Indies and British Guiana take second and third place respectively in regard to the imports of this material into the United Kingdom. Both the amount and value are seen by the figures quoted to be undergoing an increase As is well known, the United Kingdom derives the greater part of its cacao supply from the West Indies. The imports in 1912 were 17,344,990 lb. valued at £455,981. It may be well to bear in mind, however, that West Africa—in particular the Gold Coast—is rapidly catching up the West Indian supply in regard to both quantity and quality.

In the section dealing with cotton, the British West Indies comes second on the list which is headed by India. This position has been attained rather by the high quality of the produce than the quantity produced. It may be noted that a serious decrease in both amount and value took place in 1912. In regard to other produce, the importance of the West Indian supply of lime products and spices is brought out in the publication. In regard to the latter class of articles, the rapid development of the lime industry in Dominica and St. Lucia would appear to indicate that the West Indian status in this respect, is likely to continue to improve.

Regarding those forms of raw material in the supply of which, to the United Kingdom, the West Indies takes little part, mention may be made of rubber, and to some extent, sugar. It is of general interest to note that the total imports of rubber into the United Kingdom in 1912 were 1,100,471 cwt. valued at no less than £21,580,331. There is every possibility of an increase in the production of rubber in the British possessions, and part of this development will take place in British Guiana, Trinidad and Dominica.

In the next column we present a few ideas in regard to the importance of an increased supply of raw material coming from the Tropics.

Industrial Centres and the Supply of Tropical Produce.

Under the heading of The Trek to the Tropics, an article in a recent issue of *Tropical Life* seeks to show why England must establish agricultural colleges for those colonies which lie within the torrid zone. In Great Britain there is said to be a rural exodus to the towns of 10 per cent. It is obvious, then, that such a movement brings a double evil on the community because it means 10 per cent. more mouths to be fed but 10 per cent. less producers to feed them. There is, therefore, a difference of 20 per cent. in the position of the supply and demand of foodstuffs.

In continuation of this idea, the necessity in the first place of an adequate supply of foodstuffs hardly needs pointing out. But as well as foodstuffs, there must be an adequate supply of raw material for manufacturing purposes in order to keep the increasing urban populations supplied with work, and to enable them to earn the wherewithal to buy imported food.

Great Britain's tropical colonies serve, in the production of raw materials like cotton and rubber, a most important, economic, and truly Imperial service, in that they provide the English industrial classes with the means to purchase flour and meat imported from other parts of the Empire like Canada and Australia; or, in other words, the benefit circulates around the Empire. The production of commodities like raw sugar and cacao also serves a double purpose, in that it both supplies the manufacturer with material and the community with food.

From every point of view it is necessary that the supply from the Tropics should not merely be maintained but increased. Development will take place quickest when the business and science of planting can be studied on the spot under organized conditions, and when the latent potentialities of the unexploited tropical possessions are studiously kept before the eyes of desirable emigrants.

Forests and Rainfall: A New Aspect.

The influence of forests on rainfall is a subject which is continually engaging the attention of meteorologists and those interested in sylviculture. Scientific support of the supposition that wooded areas increase or control precipitation has until recently been somewhat indefinite. This would appear to have been due largely to the prevailing tendency to generalize too widely. Mr. Raphael Zon, of the United States Forest Service, publishes an article in *Science* (July 18, 1913) which deals with considerations on the subject, restricted to the effect of forests on the humidity of prairie regions situated to their leeward. He concludes: 'If the effect of mountainous forests upon the precipitation of regions lying in the lee of them is not entirely clear to us, the effect of forests in wide plains of continents, especially in the path of moist winds, cannot be doubted. By increasing the evaporation from the land at the expense of surface run-off, they enrich with moisture the passing air currents, and in this way help to carry it in large quantities into the interior of continents.'

It would appear that the precipitation of the eastern half of the United States is intimately connected with the prevailing south winds, and that land contributes more to precipitation than the ocean. So that in spite of the fact that quantitative proof is lacking, it would appear extremely probable that the rainfall of the prairie region depends upon the influence of the forests of the Atlantic slopes.

Early Conceptions Regarding Fungi.

In her Presidential Address before the British Mycological Society, Miss Gulielma Lister, F.L.S., has sketched in an able manner the work and influence of past students of the mycetozoa. It may be explained for the benefit of the general reader that the mycetozoa constitute a well-defined group of organisms which, as the name implies, occupies an intermediate position between the animal and the vegetable kingdoms. In this group, a spore provided with a firm wall produces on germination an amœboid swarm-cell which soon acquires a flagellum or whip-like process. The swarm-cells multiply by division and subsequently coalesce to form a plasmodium which exhibits a rhythmic streaming. Each swarm-cell, however, does not lose its individuality. It may be noted, too, as an interesting and significant fact, that these swarm-cells are capable of ingesting bacteria.

To revert to the subject of Miss Lister's address, it is a striking fact how strongly imagination and superstition could and does govern the formation of opinions. This circumstance is illustrated in the following quotation from the commencement of the address: 'If the mycetozoa were observed at all by the earlier Naturalists, they were considered to be Fungi, and Fungi were regarded as objects of superstition and mystery, rather than as living plants.

'Writing in the second half of the 16th century, the German herbalist Hieronymous Bock gave expression to the opinion of the times when he writes, in his chapter on Fungi: "mushrooms are neither herbs nor roots, neither flowers nor seeds, but merely the superfluous moisture of the earth and trees, of wood and other rotten things."

'Again, the Italian botanist Cesalpine . . . . . writes in 1583: "Some plants have no seed: these are the most imperfect, and spring from decaying substances: they have only to feed themselves and grow, and are unable to produce their like: they are a sort of intermediate existences between plants and inanimate nature.

About the beginning of the 18th century a more scientific spirit began to awaken. The work of Micheli, Haller and Linneus, but more particularly with the work of Charles Persoon, the study of the fungi and especially that of the Mycetozoa made great strides. Then followed the studies of Fries, Berkeley and others which culminated in the epoch-making researches of De Bary (who first observed the spores in the Mycetozoa give birth to swarm-spores) and in the critical and exhaustive treatment of the group by Arthur Lister the father of the recently appointed President of the British Mycological Society.

INSECT NOTES.

SUGAR-CANE PESTS IN BRITISH GUIANA.

A very interesting paper by Mr. H. W. B. Moore, has recently been received, entitled, A General Report on Insect Pests for the year 1912—to Messrs. Curtis, Campbell & Co., and Messrs. Booker Bros., McConnell & Co.

The report deals almost entirely with the insect pests of sugar-cane, and is based on investigations carried out during 1912, on the estates of the firms to whom the paper is addressed. The following abstract of the report is likely to be of interest to sugar-cane planters throughout the West Indies.

The large moth borer (*Castnia licus*) was present on most if not all the estates, to a much less extent than in 1911, and its decrease constitutes one of the outstanding features of the year under review. The number of moths captured on sixteen estates was 296,214, and of caterpillars and chrysalides 672,104; whilst on one plantation, where the record was kept for moths, caterpillars and chrysalides together, the number recorded was 50,583; the grand total for the insect in the three stages on seventeen estates being 1,018,901, as against 2,384,430 for the preceding year.

The decrease in the numbers of this insect captured in 1912 is stated to be due in part to the extreme drought which prevailed for nine months, and also to the direct result of the excellent work of collecting in 1911, which greatly reduced the numbers available for propagation.

On one estate, nearly 200,000 caterpillars were taken in the month of November 1911, whilst less than one-third of that number was captured on the same estate during the whole of 1912. In certain fields, the proportion of infested to non-infested stools in 1911 was as high as 1 in 4 or 5 as compared with 1 in 30 in 1912; many stools showed the presence of two or more caterpillars per stool in 1911, while in 1912 few such cases were observed.

The collection of caterpillars and chrysalides from the cane stools is considered the most efficient direct method of reducing the numbers of *Castnia licus*, and this aided by the capture of the moths, by the erection in the fields of bird-perches just after cropping, results in a great reduction in the numbers, if not in the practical extermination, of this insect.

CONCLUSIONS AS REGARD METHODS OF CONTROL.

The conclusions arrived at in the report with regard to the large moth borer are:—

(1) Long-continued drought affects the insect adversely.

(2) The persistent and vigorous collecting of caterpillars and chrysalides in the stools of canes is the most effective method of fighting this pest.

(3) The collection of the moths is a very useful practice.

(4) Birds may be encouraged by means of perches in the cane fields, and these are useful aids in the control of the large moth borer.

(5) Continued warfare must be kept up against this pest until it is reduced to very small numbers over a series of years. A decrease for one year should not be taken as a reason for ceasing control operations.

(6) Continued efforts on one estate, or on a group of estates may result in practically freeing them from *Castnia licus*, although in localities near by the pest may be abundant. In such cases, however, the numbers can be kept down only by persistent effort year after year.

The small moth borer is stated to be the most important pest of sugar-cane in British Guiana, and to be more abundant at present than it was, say, twenty-five years ago. Under the common name of small moth borer are included two species, *Diatraea saccharalis* and *D. canella*. A list of seventeen estates is given on which the practice of collecting caterpillars and chrysalides by cutting out 'dead hearts' has been carried out, the number recorded being 15,285,960 in 1912, as compared with 13,632,655 in 1911.

It is advised that collecting should be commenced at the earliest possible moment, in order to prevent, as far as possible, the complete development of the larvae of the first generation, thus largely eliminating the second and third generations.

The above account will be continued in the next issue of the *Agricultural News*.

CACAO THRIPS IN FLORIDA.

The cacao thrips (*Heliothrips* [Physopus] *rubrocinctus*), which is well known as a pest in all the islands of the West Indies where cacao is grown, has now made its appearance in Florida, where it is assuming an important rôle on account of its attacks on mango and avocado pear. In addition to the West Indies and Florida, the red-banded thrips, as it is called, is recorded from Ceylon, Uganda and Hawaii; it has also been observed on plants from Mauritius in a greenhouse at Washington.

An account of its occurrence in Florida, and a technical description of the insect in its different stages of growth are given by H. M. Russell, in *Bulletin 99, Part 2, of the Bureau of Entomology* United States Department of Agriculture.

Reproduction is parthenogenetic during a portion of the year, and bisexual at other times, the males being much less numerous than the females.

The use of black leaf tobacco extract and whale oil soap is recommended for the control of the red-banded thrips, the proportions being as follows:—

Black leaf tobacco extract	1 gallon
Whale oil soap	1 lb.
Water	50 gallons.

The whale oil soap is first dissolved in a portion of the water, the black leaf tobacco extract is then added, and the solution diluted to make the full amount. This should be applied as a fine spray at a good pressure, so as to coat thoroughly both surfaces of the leaves and the pods. The above mixture, used as a spray, has given good results in Florida.

Another formula that also has a satisfactory action is the following: Take 1 part of the black leaf tobacco extract containing 40 per cent. of nicotine solution to 1,500 to 2,000 parts of water, and add 1 lb. of whale oil soap to every 50 gallons of the mixture. This is sprayed on the trees in a similar manner to that indicated above.

At a meeting of the Board of Agriculture, Trinidad, the subject of spraying cacao was discussed. The Entomologist recommended spraying russet-coloured pods as soon as they are observed, since this condition generally indicates the occurrence of thrips. In connexion with the cacao beetle pest, a spraying demonstration has been arranged by means of which it is hoped that the interest of the planters may be fully aroused as to the practical value of the operation.

TORTOLA. REPORT ON THE EXPERIMENT STATION, 1911-12.

In view of the fact that attention is devoted almost entirely to economic matters at the experiment station, the greatest amount of interest in this report attaches, first, to the section describing the result of crop investigations.

PLOT EXPERIMENTS.

In regard to the work with limes, useful information has been obtained which would appear to indicate that although clean weeding has at first the effect of stimulating growth and of increasing the crop, the after-effects are bad. In connexion with the yield of limes, considering the dry weather, the returns for the year under review were distinctly satisfactory. The experiments with sugar-cane consisted of plot trials with some dozen different varieties. The list is headed by Sealy Seedling, which yielded cane at the rate of 19 tons 16 cwt. per acre. This forms a striking contrast with the 3 tons 4 cwt. produced in the case of the Bourbon. B. 1753 and B. 6450 gave satisfactory returns.

The section under consideration concludes with a reference to a trial with a variety of cotton known as Southern Cross. The results of experiments with thirty varieties of cassava are also included, the remarkable difference in the yields being a matter of much local economic importance.

PROGRESS IN THE CHIEF INDUSTRIES.

The notes on economic plants which follow, possess many points of interest. The cultivation of coco-nuts is deserving of encouragement in spite of economic difficulties pointed out in the report.

The Government control of the cotton industry stands out prominently as the main feature of agriculture in the Virgin Islands. It may be noted that the Tortola cotton has shown a steady improvement as regards quality during recent years, a fact which indicates the increased amount of care in its cultivation by the peasantry, and the value of good organization in regard to ginning, collecting and distribution.

An interesting feature of the lists of exports from the Virgin Islands given in this section is the very large number of live stock shipped, and in view of their circumstance, it is to be hoped that the importance of selection, and of some sort of registration in breeding, may be well kept in mind.

REPORT ON THE PROGRESS OF AGRICULTURE IN INDIA, 1911-12.

This brief account of the recently published report by the Agricultural Adviser to the Government of India, is taken principally from the introductory chapter which conveniently constitutes a résumé of the entire booklet.

COTTON.

Dealing first with the efforts of the Department in connexion with cotton improvement it is shown that the present area under improved varieties is rapidly extending. In Madras, for instance, the present area under cotton exceeds that of any previous year by nearly 300,000 acres. In the United Provinces, too, a white-flowered variety giving 19 per cent. more seed-cotton than any other existing varieties, is being distributed to cultivators and it is estimated that the 2,000 acres grown last year will this year be increased to 20,000 acres. In India, the problem of cotton improvement appears to be diametrically opposite to that in the West Indies. In India, yield, and not quality, is the fundamental object to be aimed at; in India increased returns and increased ginning percentage combined with hardiness of habit in the plant, means more money for the cultivator than mere length and fineness of staple. There is indeed evidence to show that, on the whole, the cotton now grown in India is inferior in quality to that of many years ago.

SUGAR.

The fundamental problem in the saving of the Indian sugar industry lies in better cultivation and the introduction of cane possessing a larger percentage of sugar and higher purity of juice. In view of this fact a cane-breeding station has recently been established in Madras with Dr. Barber in charge; an engineer has also been appointed whose attention will be directed mainly to the study of methods of manufacture. Sugar cultivation is also being stimulated by the establishment of central factories.

Considerable activity has also been directed towards the improvement of the palm sugar industry (see *Agricultural News*, Vol. XII, No. 294).

GROUND NUT AND OTHER FRUIT CROPS.

Dealing next with the ground nut crop, and with experiments on fruit, a large increase in area is shown in the case of the former, whilst in connexion with the latter, the investigations of Mr. and Mrs. Howard are likely to assume proportions of great economic importance.

VETERINARY INVESTIGATIONS.

The work of the Indian Veterinary Department is well known in a general way. The economic value, however, of this section of the department may not be widely comprehended. It appears that enormous damage is inflicted in India by sudden epidemics of rinderpest, which will in one stroke waste the hard-earned savings of the peasant cultivator. A new pair of bullocks have to be purchased which means that he will be driven once more into the hands of the money lender. With a view to combating cattle disease, laboratories have been established in the United Provinces principally for the manufacture of sera. It is stated, however, that a greater number of veterinary assistants and a large staff of inoculators to cope with outbreaks on an extended scale are urgently needed.

ECONOMIC DEVELOPMENT.

The final paragraph in the chapter under consideration contains a few suggestions in regard to general economic development in India. Reference is made to the passing of the Development Funds Act in England, and to the large sums of money set aside for developing agriculture and rural industries, and it is noted that the Indian Government have recently followed the example by granting for similar purposes 10 lackhs of rupees.

GLEANINGS.

It is stated in the *Barbados Standard* (August 7, 1913), that the next local agricultural exhibition for peasant proprietors and school children will be held on December 3, 1913.

A statement is made in *Popular Mechanics* (July 1913), to the effect that, at a recent corn meeting in South Carolina, it was said that a yield of 228 bushels per acre of Indian corn was obtained in one of the competitions.

In Antigua, according to the Curator of the Botanic Station, cotton planting has been discontinued on account of dry weather. The young cane crop is showing the ill-effects of two dry months.

It appears from the medical report on the Presidency of St. Kitts, Nevis and Anguilla for 1912, that there has been in the three islands, respectively, an estimated increase in population during the year of, 123, 158 and 127

Referring at a recent meeting of the Antigua Agricultural Society to the subject of cotton stainers, a member stated that he had obtained good results by treating cotton seed meal with Paris green and soap. (Antigua *Sun*, July 14, 1913.)

It is stated by the Agricultural Superintendent, St. Kitts, that the cotton planted early in February is now being picked and that the returns are good both in quantity and quality. The cotton planted in June is suffering for want of rain, but that established in May is reported to be satisfactory.

An improved balance of trade is shown by the Customs returns of the Union of South Africa for 1912. It is stated in the *Agricultural Journal* (April 1913) that the exports increased by 6 million sterling over those for 1911. As regards the exports of farm products, the greatest increases were shown in the case of fodder, skins, wool and tobacco.

Weather in Demerara, during the end of July, was satisfactory for the growth of the cane crop, but unless the conditions continue favourable, the yield of the canes for the reaping at the end of the year is likely to be disappointing. The local sugar market is rising steadily. No sugar was shipped to Canada during the previous fortnight. (*Daily Argosy Mail Edition*, July 19, 1913.)

Considerable interest has been shown lately in Trinidad in regard to agricultural banks. A letter in the *Port-of-Spain Gazette* (July 19, 1913) suggests that a probationary or educational period is required for peasants in that island, and advocates the institution of Crop Advance Warrants for cacao and other produce. Such a system, it is believed, would pave the way for more advanced systems of co-operative banking.

Statistics are given in *The Board of Trade Journal* (June 5, 1913) concerning sugar production in Egypt during 1912. It is stated that the estimated crop is about 10 per cent. more than that of the previous year. The increase does not appear to be due to more favourable weather conditions, but to extension of the area under sugar by some 5,190 acres, and the substitution of the 105 Java cane for Baladi.

A leading article in the *Dominica Guardian* (July 11, 1913) again draws attention to the glut of limes on the New York market. A letter received from a New York firm is reproduced, which advises a reduction in the exports for the present, since, owing to excessive supply, prices will be forced down. It is stated further that many limes in the recent shipments have been small and immature.

In describing the causes and effects of the drought of 1907 and 1908 on the Sal Forest of the United Provinces, it is concluded in an account in *Forest Bulletin* No. 22, of the Forest Research Institute, that an undergrowth of drought-hardy species is of special importance, particularly in view of the fact that the existence of this soil covering provides protection, and also a reserve in the event of any future destruction of the over-wood

A Statement in *Diplomatic and Consular Reports* No. 5103—Annual Series, shows that in America, Baltimore imported during 1912 from Jamaica produce valued at £205,822; from Trinidad £547; from the other British West Indian islands, £10,667. The exports to Jamaica were worth £17,019, and those to other British West Indian islands were valued at £5,191.

An article in the *Tropical Agriculturist* (June 1913) states that the recent village show held at Kalawellawa was visited by a large number of villagers and headmen, and that the exhibits, which included different kinds of fruits and vegetables, were distinctly creditable. It would appear that the system is of considerable value in arousing healthy competition, and as a means for introducing new varieties of plants and improved methods of cultivation.

A note in the *Experiment Station Record* (June 1913) refers to observations showing that the growth of grass is more vigorous in the vicinity of certain natural sources of carbon dioxide. It is believed, from the results of pot experiments, that the growth of crops might be increased by the addition of carbon dioxide to the air in the open field. The author believes that the carbon dioxide would be absorbed by the leaf before it had time to diffuse into the surrounding atmosphere.

At a recent meeting of the St. Vincent Arrowroot Association, it was resolved that, in view of the present market situation, the unsold portion of the 1912-13 St. Vincent arrowroot crop, and the whole of the crop for 1913-14, be held for England at 3¼*d.* per lb., and that a telegram be sent to the Association's Brokers advising them of the resolution. Consequently, for the next eighteen months at least, St. Vincent arrowroot will not be sold in England below 3¼*d.* per lb. (St. Vincent *Sentry*, July 18, 1913.)

STUDENTS' CORNER.

AUGUST.

SECOND PERIOD.

Seasonal Notes.

The commercial aspect of the application of artificial manures to growing crops is often not fully appreciated. The efficiency of a manure does not depend merely on its producing an increase of yield, the increase produced must be sufficiently large to pay for the cost of the manure and its application, and still leave a margin of profit. Furthermore, the value of a manure does not rest entirely upon the amount of the constituent elements or groups of elements present. A most important feature is the form in which the constituents—nitrogen, phosphoric acid and potash, as the case may be—occur. Sulphate of ammonia, for instance, contains a higher percentage of nitrogen than nitrate of soda, yet it does not act on ratoon canes as quickly as the latter fertilizer. In valuing manures, a useful scale is that adopted by the Barbados General Agricultural Society some years ago, and reproduced in the *Agricultural News*, Vol. IV, p. 286.

The above remarks apply also in relation to artificially prepared foodstuffs for cattle. An idea of a food's composition is necessary before an estimate can be made of its value. Nevertheless feeding experiments are also required, since one foodstuff though chemically richer than another is not always assimilated as readily. A case in point is afforded by that interesting discussion which took place at the last annual meeting of the British Association for the Advancement of Science. In this discussion, which was referred to in the *Agricultural News*, Vol. XII, p. 141 under the heading, The Verdict of the Animal, it was proved that although Bombay cotton seed cake was less rich, chemically, than Egyptian, it produced a greater increase in live-weight. At the same time, of course, the fuel value of a foodstuff varies directly with the sum of the percentages of albuminoids, fats and soluble carbohydrates expressed in terms of starch, though the amount available for actual work is that which is left after supplying the necessary energy for digestion and maintenance.

Cultural operations in lime plantations such as forking, manuring, draining and weeding should be completed during this quarter, and attention may now be directed to planting out, and to the crop already established. In dry localities, it is well to plant early, in holes made some weeks ago. Seeds should now be sown to produce seedlings for transplanting later, but seedlings transplanted now will form good planting-out material towards the end of the year.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What is the function in plants of (a) cane sugar, (b) latex?

(2) What are the direct and indirect uses of atmospheric dust to vegetation?

INTERMEDIATE QUESTIONS.

(1) Write an account of Prinsen Geerligs' theory of molasses formation.

(2) Compare, in a general way, the feeding value of (a) cacao husks, (b) lime skins, (c) molascuit, (d) Indian corn.

FINAL QUESTIONS.

(1) What are your views as to the possibilities of introducing motor cultivation (a) into the West Indies, (b) on to the estate you are connected with?

(2) If it is desired to form a limited liability company for the purpose of taking over and working a West Indian plantation, describe the different ways in which the money may be raised. What system of accounting should be adopted in a properly organized undertaking?

THE PHILIPPINE COLLEGE OF AGRICULTURE.

The catalogue for 1912-13 and the announcements for 1913-14 of the University of the Philippines, have just been received, and in view of the interest which is being taken at present in tropical agricultural colleges, the following information has been taken from that section of the publication dealing with the Philippine College of Agriculture.

This institution which began its class work in June 1909, was the first college to be organized as a part of the university. The permanent buildings of the college were finished in January 1911. These include: (1) an administration and academic building containing the office of the Dean, five class rooms, two library rooms and a large reading room; (2) a laboratory building, housing the department of botany and chemistry; (3) a stable and bodega; (4) a silk culture house; (5) a plant propagation house. These buildings are all constructed of reinforced concrete, and another building for the department of animal husbandry is now in course of construction.

The attendance at the college during the first year was fifty-six; during the second year there were ninety-five students, and in the third year their numbers rose to 175. There are now 253 students in regular attendance.

The tuition in the college is free; and there are no matriculation or graduation fees. A deposit must be made at the beginning of each year by each student, except those in the first two years of the sixth-year course. This is to cover destruction of property, and a balance remaining, after paying for property lost or destroyed, is returned at the end of the year. In all laboratory and field work, the students are responsible for all college property given into their care.

The college of agriculture offers different undergraduate courses: (1) a six-year course, (2) a four-year course, (3) a four-year course in forestry. Students admitted to these systems of study, unless trained in a public school, have to obtain an entrance certificate.

The subjects which have to be studied in the ordinary curriculum include those branches of agricultural science with which the reader of the *Agricultural News* is familiar; they include agricultural chemistry, economic botany and zoology, animal husbandry, veterinary science, rural engineering, sylviculture and agricultural law.

Ceylon's request for a College of Tropical Agriculture which found expression in the publication of a report already noted in this journal, has given cause for considerable criticism. Under the heading of a Plea for a Ceylon College for Tropical Agriculture, the *Field* remarks that the value of the Ceylon report is greatly weakened at the outset by its avoidance of the question whether there is any real need for a College of Tropical Agriculture in Ceylon itself. It would seem that public opinion in London is inclined to attach considerable importance to local requirements of the colony in which the institution is situated, although its influence should be by no means restricted to its immediate surroundings.

FUNGUS NOTES.

RECENT FRENCH WORK ON DISEASES OF HEVEA AND CACAO.

In a paper published in the *Bulletin Trimestrial de la Société Mycologique de France*, Griffon and Maublanc refer to P. Henning's account (1904) of a leaf disease of *Hevea brasiliensis* caused by *Dothidella Ulei*, well known in the higher valley of the Amazon. Recently, the authors have investigated the same species collected in another region near Balem (Para), at the mouth of the Amazon. Although Griffon and Maublanc's description of the perithecia agrees with Henning's, the French investigators were unable to observe the pycnidia referred to by Henning as the aposphæriacious stage. They found, however, masses of immature asci in the stroma, and fructifications composed of very small cylindrical spores, much smaller than those of *Aposphæria Ulei*, Henn. They also noticed another form of conidium of the Scolecothricum type related to the perithecial stage of Dothidella.

The authors conclude that *D. Ulei*, with its different forms of fructifications, is certainly a parasite of the leaves of Hevea, but it does not seem to cause any great amount of harm. On well developed trees, the ravages are without doubt almost insignificant. Plants in the nursery seem to suffer most. The specimens examined by the authors had been collected from seedlings growing under these conditions.

In connexion with the above observations, reference may be made to van Hall's account in 1908 in Bulletin No. 24, of Department van den Landbouw, Suriname, of a fungus attack on Hevea trees in the nursery of the Botanic Gardens. The disease produced a spotting of the leaves, which spread in concentric circles. Only young leaves were attacked. Trees situated under favourable surroundings appeared not to be susceptible. The name of the causative fungus was not definitely stated.

Fungi living as saprophytes on the branches of cacao trees in the island of Perroquets, at the estuary of the Gabon, are remarked upon in an article published in the *Journal d' Agriculture Tropicale* (May 31, 1913). During 1911-12, the trees in a certain district suffered severely from drought, and eventually exhibited a large number of dead branches. On these branches was observed a vigorous growth of fungi apparently belonging to the Polyporaceae. The chief one present was identified by Hariot as *Hexagonia discopoda*, Pat.—a species well known throughout tropical Africa. Hariot believed it to be only saprophytic. The diseased branches were burnt.

In regard to indigenous cacao on the Gold Coast, the same article mentions the recent observation, by MM. V. Henri, of the presence of *Marasmius scandens*, which forms little black filaments around the branches and trunks of the trees growing in shaded situations.

THE PHILIPPINE FIBRE INDUSTRY.

The editorial article in a recent number of the *Philippine Agricultural Review* (April 1913) gives an interesting summary of the progress and condition of the fibre industry in the Philippines, and mentions the more important of the fibre plants cultivated. This industry, which is carried on to a greater or less extent in every municipality, and practically every barrio of the Islands, includes the production and preparation of a very large number of vegetable fibres, which comprise the most important export product of the territory, and include a great variety of materials that enter into the domestic economy of the people.

MANILA HEMP.

Manila hemp (Abacá as it is locally known), the most important fibre in the Philippine Islands, has for a number of years comprised approximately two-thirds of the total export trade. The present condition of the Manila industry, however, is said to be not satisfactory. This is attributed to a monopoly in the production of the fibre by the Philippine planters, who failed to introduce improved methods either in working their plantations or in the preparation of the fibre for market. Consequently many of the plantations are in badly run-down condition, and large quantities of inferior fibre are being produced. The planters, however, are coming to realize the needs of the situation, and there is a strong demand for assistance in the work of introducing improvements. This demand is proposed to be met in the immediate future by the establishment of a co-operative demonstration station in the heart of the abacá-producing district of southern Luzon. Other stations will be started as rapidly as the necessary arrangements can be made. These stations will serve as headquarters for the demonstration of improved methods, and from them trained inspectors will be sent out to assist and instruct the planters on their own farms.

MAGUEY.

The fibre second in commercial importance to abacá is maguey. The maguey industry suffered during the past few years from prevailing low prices, but is reported to be in a greatly improved condition at present. The most vital feature of this industry is the question of introducing modern fibre-cleaning machines. Such machines have been perfected and are available, but their profitable operation requires a larger supply of raw material than the individual Philippine maguey planter is in a position to furnish.

KAPOK.

Another fibre of increasing importance in the Philippines is kapok, sometimes called 'tree cotton'. This fibre is coming into very general use as a material for filling cushions, mattresses and other articles. The demand for kapok already exceeds the supply; prices are high, and this fibre has a very promising future. Kapok trees are found scattered throughout the length and breadth of the Philippine Archipelago, and the conditions are said to be entirely suitable for their more general planting. A large part of the fibre now produced is wasted, but it is believed that as the value of this product becomes better known, it will be more generally utilized, and kapok trees will probably be planted to a considerable extent as a secondary crop.

FUTURE DEVELOPMENT.

There are many other fibres that are largely used locally and are of some importance to the inter-island trade. The development and improvement of abacá, maguey, and kapok, however, receive first attention. Each one of these industries has its own special features, but the general problem is the same for all, this problem being the definite ascertaining of such improvements as it may be practicable for the Philippine farmer to introduce, and then to transmit this information in such a way that it can be utilized.

NEUTRALIZING THE PUNGENCY OF GINGER.

The following useful hints in regard to the removal of the pungency of ginger are taken from the *Journal of the Jamaica Agricultural Society* ,for April 1913.

The Agent-General for Queensland in London was, at the instance of the Department of Agriculture and Stock, requested by the Chief Secretary to obtain full information relative to the methods in vogue in China for the purpose of neutralizing the pungency in ginger intended for use as dessert (preserved ginger). A request was also made for rhizomes for planting purposes of special varieties.

On receipt of this application from the Chief Secretary, the Colonial Secretary, Hong Kong, courteously supplied full information as follows:—

'The ginger is washed and the skin is scraped off. It is then punched with forks and washed in rice water (the water left after washing rice), to improve the colour. It is then boiled in three or four changes of refined sugar and water for one or two hours, until it is properly soaked, and then put in barrels and covered with syrup.

'In the case of dry preserved ginger, the wet ginger is strained till dry; dry sugar is placed on bamboo matting, and the ginger is rolled in it till it is coated with sugar.

'Stem ginger is the young and tender shoots on the roots. Cargo ginger is what is left after cutting off the "stem".

'Further information on the cultivation pursued for the production of the least pungent kind of ginger, is supplied by Mr. M. W. T. Tucher, Superintendent of the Botanical and Forestry Department, Hong Kong. Mr. Tucher writes: "All Chinese ginger is less pungent than the Jamaican variety, but whether the pungency is due to cultivation or to the variety of the plant, I am unable to say.

' "The method adopted by the Chinese in cultivating this plant, I am informed, is as follows: The rhizomes are planted in the spring in ridges about 1 foot high and 2 feet apart. The rhizomes are set in ridges about 6 inches apart. Low-lying ground is generally selected, and water is kept continually between the ridges.

' "When the young shoots are from 6 inches to 1 foot above the ground, the plants are heavily manured with urine or nightsoil mixed with water. This is repeated at frequent intervals.

' "About three months after planting, the first crop of ginger is ready. This is known as "young ginger," and is the least pungent and the most expensive. If the rhizomes are allowed to mature, which will be between October and December, they become more pungent, but nothing like the Jamaican." '

The opening of the new wing at the Rothamsted Experimental Station is described in *Nature* (July 3, 1913). The ceremony was performed by the Rt. Hon. Walter Runciman, President of the Board of Agriculture, in the presence of a large and distinguished company. The buildings include a large soil laboratory and Director's room, a botanical laboratory, library, and chemical laboratory on the first floor,and a glass-house for water-cultures on the roof. Special rooms are provided in the basement for polarimeter work, and for soil incubation.

Royal Agricultural Show.—In view of the fact that a comprehensive account of the recent Royal Agricultural Show held at Bristol has appeared in the *West India Committee Circular* (July 15, 1913,) it is unnecessary to recount the success of the exhibition and particularly that part of it known as the Overseas Section. It would appear neglectful nevertheless not to express agreement with the views of the above journal in regard to the desirability for all the West Indies in future representing themselves at the Royal Show.

In connexion with this year's exhibition, an interesting note appears in *Nature* (July 10, 1913), which considers the show from a more or less scientific aspect. Reference is made to the notice which British-grown tobaccos attracted, and the increased interest shown in regard to labour-saving contrivances. The article states in conclusion: 'Readers of *Nature* are mostly familiar with the kind of exhibits represented in this [the Overseas] section, but large numbers of the populace last week were obviously keenly interested in the rubber series shown by the Federated Malay States, and the sugar samples from the West Indies and British Guiana, including food products for human and animal consumption and even a sugar-cane plant in a living and healthy state.

'The time appears to have come when intending colonists should all have the opportunity of elementary instruction in colonial or tropical agriculture before leaving the home country.'

Cyanamide as an Insecticide.—In the last issue but one of the *Agricultural News* (see Vol. XII, p. 234) reference was made to the use of cyanamide (nitrolim) as an insecticide against the froghopper of sugar-cane in Trinidad.

In the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* for April 1913, there is given a brief review of a paper by L. E. Solanet, entitled The Simultaneous Destruction of Colaspidema atra and Lucerne Dodder by Calcium Cyanamide.

The insect (*Colaspidema atra*) is a chrysomelid beetle very injurious to lucerne in France, especially in the south.

The following is copied as likely to be of interest to planters in the West Indies, especially as this substance has already been under trial as an insecticide:—

'The author states that calcium cyanamide reduced to as fine and light a powder as possible and applied annually at the rate of 90 lb. per acre, has so far proved to be the most efficacious remedy against both the beetle and parasitic plant, while at the same time, it in no wise interferes with the growth of the lucerne. As this small amount of cyanamide is difficult to spread uniformly, the writer suggests mixing it with other substances according to the following formula: cyanamide, 1 part; gypsum, 2 parts; wood ashes, 1 part.'

It will be noted that the mixture given above forms a very fair complete manure, containing nitrogen (in the cyanamide), calcium (in the gypsum), and potash (in the wood ashes) which, used as suggested, amounts to 360 lb per acre.

In the *Monthly Magazine of the Incorporated Chamber of Commerce of Liverpool* (June 1913) it is stated that the Chamber is strongly of opinion that the movement for the production of tobacco in the British Colonies and Dependencies should be encouraged by the establishment of a recognized tobacco market, where British Colonial tobaccos can be sold by public auction under conditions similar to those which obtain for other classes of produce.

MARKET REPORTS.

London.—The West India Committee Circular, July 29, 1913

Arrowroot—3¼d.

Balata—Sheet, 2/9; block, 2/1 per ℔.

Beeswax—No quotations.

Cacao—Trinidad, 71/- to 78/- per cwt.; Grenada, 64/- to 68/-; Jamaica, no quotations.

Coffee—Jamaica, no quotations.

Copra—West Indian, £32 per ton.

Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 24*d.* to 28*d.*

Fruit—No quotations.

Fustic—No quotations.

Ginger—Neglected.

Isinglass—No quotations.

Honey—No quotations.

Lime Juice—Raw, no quotations; concentrated, no quotations; otto of limes (hand-pressed), 15/.

Logwood—No quotations.

Mace—1/11 to 2/6.

Nutmegs—4½*d.* to 4¾*d.*

Pimento—Quiet, 2½*d.*

Rubber—Para, fine hard, 3/8; fine soft, 3/2; Castilloa, 2/4 per ℔.

Rum—Jamaica, 2/4½ to 6/- per gallon.

New York.—Messrs. Gillespie Bros. & Co., July 25, 1913.

Cacao—Caracas, 14¼c. to 15c.; Grenada, 14c. to 14¼c; Trinidad, 14c. to 14⅜c.; Jamaica, 12c. to 14c.

Coco-nuts—Trinidad and Jamaica, selects, $38·00 to $40·00; culls, $24·00 to $26·00 per M.

Coffee—Jamaica, 10c. to 13c. per ℔.

Ginger—7½c. to 10½c. per ℔.

Goat Skins—Jamaica, 50c.; Antigua and Barbados, 48c. to 50c.; St. Thomas and St. Kitts, 44c. to 46c. per ℔.

Grape Fruit—Jamaica, no quotations.

Limes—$2·10 to $6·00

Mace—46c. to 53c. per ℔.

Nutmegs—110's, 12½c.

Oranges—Jamaica, no quotations.

Pimento—4⅛c. per ℔.

Sugar—Centrifugals, 96°, 3·54c. per ℔.; Muscovados, 89°, 3·04c.; Molasses, 89°, 2·79c. per ℔., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., August 4, 1913.

Cacao—Venezuelan, $14·00 to $14·25 per fanega; Trinidad, $13·75 to $14·10.

Coco-nut Oil—$1·30 per Imperial gallon.

Coffee—Venezuelan, 14¾c. per ℔.

Copra—$5·00 per 100 ℔.

Dhal—$4·75 to $5·00

Onions—$1·75c. to $2·10 per 100 ℔.

Peas, Split—$6·20 to $6·25 per bag.

Potatoes—English, $2·00 to $2·30 per 100 ℔.

Rice—Yellow, $5·45 to $5·50; White, $5·40 to $5·50 per bag.

Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., August 2, 1913; Messrs. T. S. Garraway & Co., August 2, 1913; Messrs. Leacock & Co., August 1, 1913.

Arrowroot—$5·25 to $7·00 per 100 ℔.

Cacao—$14·00 to $15·00 per 100 ℔.

Coco-nuts—$18·00

Hay—$1·50 per 100 ℔.

Manures—Nitrate of soda, $70·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $82·00 to $85·00 per ton.

Molasses—No quotations.

Onions—$2·50 to $3·00 per 100 ℔.

Peas, Split—$5·00 to $5·50 per bag of 210 ℔.; Canada, $4·00 per bag of 120 ℔.

Potatoes—Nova Scotia, $2·50 to $3·75 per 160 ℔.

Rice—Ballam, $5·15 to $5·85 per 190 ℔.; Patna, no quotations; Rangoon, no quotations.

Sugar—American granulated, $4·00 per 100 ℔.

British Guiana.—Messrs. Wieting & Richter, August 12, 1913; Messrs. Sandbach, Parker & Co., August 1, 1913.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	8c. per ℔.	—
Balata—Venezuela block	No quotation	—
Demerara sheet	65c. per ℔.	—
Cacao—Native	12c. per ℔.	13c. per ℔.
Cassava—	60c.	—
Cassava Starch—	$4·00 to $5·00	—
Coco-nuts—	$16 to $20 per M.	$10 to $16 per M.
Coffee—Creole	16c. per ℔.	17c. per ℔.
Jamaica and Rio	16c. per ℔.	17c. per ℔.
Liberian	13½c. to 14c. per ℔.	12c. per ℔.
Dhal—	$4·50 per bag of 168 ℔.	$4·75 per bag of 168 ℔.
Green Dhal	$5·50	—
Eddoes—	$1·32	—
Molasses—Yellow	None	—
Onions—Teneriffe	3½c.	4c.
Madeira	5c.	5c.
Peas—Split	$6·25 per bag (210 ℔.)	$7·00 per bag (210 ℔.)
Marseilles	—	—
Plantains—	10c. to 32c.	—
Potatoes—Nova Scotia	$2·40 to $2·75	$2·75
Lisbon	—	$1·20
Potatoes-Sweet, B'bados	$1·44 to $1·68 per bag	—
Rice—Ballam	No quotation	—
Creole	$4·75 to $5·00	$5·00
Tannias—	$1·56	—
Yams—White	$3·00	—
Buck	$1·92	—
Sugar—Dark crystals	$2·25 to $2·30	$2·25
Yellow	$2·50	$2·40
White	$3·75 to $4·00	$4·00
Molasses	$2·00	—
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	—

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in 1903-5, No. 40, price 6*d*.; in 1904-6, No. 44, price 6*d*.;
in 1905-7, No. 49, price 6*d*.; in 1906-8, No. 59, price 6*d*.;
in 1907-9, No. 62, price 6*d*.; No. 66, price 6*d*.

Seedling and other Canes in the Leeward Islands,
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in 1906-7, No. 50, price 4*d*.; in 1907-8, No. 56, price 4*d*.;
in 1908-9, No. 63, price 6*d*.; in 1909-10, No. 67, price 6*d*.

Manurial Experiments with Sugar-cane in the Leeward Islands,
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WEST INDIAN BULLETIN.

(Vol. XIII, No. 3.)

Containing Papers on RUBBER AND MISCELLANEOUS SUBJECTS, prepared for the recent Agricultural Conference, comprising:—RUBBER: Rubber Experiments in Trinidad and Tobago, by A. E. Collens; Rubber Experiments in British Guiana, by Professor Harrison and others; Castilloa Rubber in Dominica, by Joseph Jones and G. A. Jones; Notes on Cultivation of Para Rubber, by F. Evans; Note on the Present Position of Rubber in Grenada, by G. G. Auchinleck, B.Sc., F.C.S.; Rubber Cultivation, by Dr. P. J. S. Cramer; MISCELLANEOUS: Forestry in Trinidad, by C. S. Rogers; A Method of Estimating Calcium Carbonate in Soils, by H. S. Shrewsbury, F.I.C.; Milking Capacities of the Trinidad Government Farm Cows, by Herbert L. Shrewsbury; The Profitable Breeding of Horses, by J. L. Shannon, D.V.M.

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OF THE

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BY H. A. BALLOU, M.Sc.,

Entomologist on the Staff of the Imperial Department of Agriculture.

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New Uses for Rubber.

THE current topic in the rubber industry is the fall in the price of plantation Para and the contemplation of the effects of the greatly increased supply in the near future. Two main points are at issue, and they must be clearly differentiated between. There is first the contention that the difference between the price of fine hard Para—the Brazilian product—and the price of plantation Para—the Eastern, and chiefly British-grown commodity—is artificial. The second point is: provided plantation Para is given fair recognition on the market, can the higher prices which would result be maintained in years to come? These important questions can be best dealt with separately. In regard to the lower value of plantation rubber there are, it appears, as in every question, two sides. The buyer, on his part, maintains that plantation rubber, seemingly of first grade quality—in so far as rough and ready, but experienced, examination by the dealer can show—does not always prove to be such when subjected to the practical test of manufacture. The Brazilian product, however, is seldom deceptive in this way. What the difference is due to, chemical examination is unable to show, though there seems to be no reason why an accurate examination of the physical properties of the rubber should be unreliable. The most satisfactory way out of the difficulty, and a way which has been advocated strongly in the Federated Malay States, is to establish standardizing departments in rubber-producing countries. The commercial value of crude rubber depends, let it be remembered, upon its value when compounded with sulphur, or in other words when vulcanized. Hence the institution of a vulcanization plant would, it is believed, lead to the possibility of producers giving guarantees which would enable them to sell direct to the manufacturer and be entirely independent of the prejudiced middleman.

But even if the best plantation Para were placed at the same market level as the Brazilian product, there is the second problem to be approached—that of increased supply upon demand. As already intimated editorially in this journal, rubber is one of those commodities, the demand for which is economically elastic. A fall in the price of manufactured rubber goods would result in a larger number of purchases. But the manufacturer does not altogether desire this change, for it would mean to him the extension, or at least the modification of his machinery and general factory arrangements. In any case a loss would be felt for a time until the proper equilibrium set in. This view has been supported recently at several meetings of large rubber companies.

But supposing new uses were found for rubber? This would not merely check the fall of market prices: it would do more; it would tend to make them rise. The discovery of new uses would meet the requirements of both producer and manufacturer, who would profit satisfactorily at the expense of the helpless consumer.

On another page in this issue reference is made to the competitions at the forthcoming international rubber exhibition. Handsome inducements are announced with reference to the discovery of new uses for rubber, and it will be interesting to examine the possibilities in this direction. In doing so it will be well to bear in mind that, broadly speaking, the conception of new uses may take the form of a spontaneous idea, the practical value of which can be gauged irrespective of any knowledge of the technical side of the employment of rubber; or, at the other extreme, a notion may suddenly occur the application of which depends on a pre-existing knowledge of technique or manufacture. Bearing in mind this principle regarding the possibility of successfully putting an idea into practice will often save the would-be inventor a considerable waste of time and energy.

A description of the present ways in which rubber is employed should prove helpful and instructive in regard to the discovery of new uses, and it will be convenient to begin by considering first the great class constituted by articles of which rubber is only a component part.

Rubber as a part of a manufactured article is seen at its best in the case of the pneumatic tyre. It may be noted in this connexion that Sea Island cotton also forms a portion of this expensive but indispensable equipment. Rubber is the chief constituent of vulcanite, and the employment of rubber for insulation purposes is a matter of common experience. It also serves a useful purpose in the making of certain waterproof textures. The rubber ring, too, though small in itself, is produced in vast quantities for use in mineral water bottles and for flanges in machinery. Then there is the employment of the commodity in surgical instruments, for shoes, and for golf and tennis balls. Whilst referring to these uses mention may be made to the employment of gutta percha and balata. The former product is, as is well known, used for insulating submarine cables. Its employment in this direction is mainly due to the the fact that unlike rubber, gutta percha is not porous. On the other hand, gutta percha melts at 100°F., so that it cannot in most instances take the place of rubber which remains solid at this temperature. Nevertheless experience in America has shown that rubber can be successfully employed for submarine insulation, even at great depths—as in the case of the Washington-Alaska cable. Balata is used for belting. This is due to its characteristic toughness, in which respect it greatly surpasses rubber.

As regards recent new uses for rubber in articles constructed of other things as well, there is the French invention which enables a deflated pneumatic tyre to be run on temporally. Briefly the arrangement consists of a rubber frame-work within the inner tube, which gives support and resiliency, while allowing air space for the provision of pressure in the normal way. In America, the safety of those who take part in the modern dizzy gyrations of the ball-room has lately been ensured by the introduction of a dancing shoe having a small rubber plug inserted near the middle of the widest part of the sole. Attempts are also being made to use rubber in the construction of such diverse articles as ankle supports, railway buffers and massage machines. Still more novel is the idea that, in view of the higher price of hides and the lower price of rubber, shoes should be constructed possessing pneumatic rubber soles.

Turning to the uses of rubber by itself, we notice such articles as toys, sponges and galoshes. Though seemingly unimportant, the galoshes industry, particularly in Russia and North America, is an enormous one, whilst the rubber sponge trade is rapidly undergoing development. In connexion with the rubber sponge, it is interesting to note that in this article it is the main object to induce porosity, just as in the manufacture of other rubber goods it is the main aim to eliminate this characteristic. Other uses for rubber in the present connexion are seen in the case of tubing and hot-water bottles. When we look around for the very modern introductions, it appears that the latest is india rubber flowers to be worn by bathers. Some of the effects obtained in this direction are stated to be very striking.

Turning to the employment of rubber in large quantities for constructional purposes, we meet greater possibilities. It is characteristic of the industry that up to the present it has not been found practicable in a general way to employ rubber in vast quantities as, for instance, for roads and pavements. In the case of certain hotels and other public places, rubber courtyards have been laid, and have apparently proved economical as regards wear and tear. It has to be remembered, however, that it is chiefly only rubber-tyred vehicles which traverse these areas. In the case of a thoroughfare, the steel tyres of heavy waggons would be likely to have a distinct depreciating effect. One thing may lead to another, in that the introduction of rubber roads might necessitate the universal adoption of rubber tyres for vehicles travelling along them. According to Dr. Schidrowitz, the wear of rubber is probably only about one-tenth that of asphalt and wood, a circumstance that will help to lead to a materialization of the main project. The cost per mile, according to the same authority, is about £29,568. It must be remembered that light has an injurious action on rubber, that is to say, rubber as it is commonly known, namely, vulcanized rubber; but on crude, untreated rubber, of little value in practice, light has but a small influence. Hence any would-be introducers of rubber for outside constructional purposes in the Tropics would do well to bear this point in mind.

In building, particularly for flooring purposes, rubber is rapidly coming into use. In cold countries it constitutes a desirable ground material for bathrooms, whilst its use in halls and reception rooms is rendered popular because it is free from dust, is noiseless, and will take paint readily. The use of rubber in building construction offers possibilities, but these uses tend to come under the class dependent on ideas, the conception, or at any rate the application of which necessitates some pre-existing knowledge of a technical nature. In this connexion familiarity with the physical and chemical properties of rubber is of value. The low conductive capacity for electricity suggests safety from lightning, elasticity (fine hard Para when properly vulcanized stretches to seven times its own length) suggests springs; poor conductivity for heat, warmth: and so on.

There is no doubt that a use may be found for rubber in the shipment of fragile cargo, both in the packing and on the ship itself. The use of rubber in navigation generally,—for instance rubber decks to facilitate walking during rough weather—has so far received but little attention: but the object of this article is not to put ideas of this kind directly into the mind of the reader, but merely to stimulate their conception.

SUGAR INDUSTRY.

SAMPLING CANE FOR ANALYSIS.

In the *Experiment Station Record* for July 1913, it is pointed out that in taking samples of cane for analysis it is almost impossible to obtain those which will be representative of the whole field or plot. Apart from this source of error due to variation amongst individual canes (a line of work, it may be added, which is deserving of increased attention) there is an error which arises when using a small laboratory mill for grinding the cane. In this, the extraction is not as complete as it would be on a large scale. Furthermore there is a notable difference between the composition of the juice expressed and that left behind in the tissues. In order to obtain accurate data along these lines, comparisons were made with the juice obtained by the laboratory mill and from a large sugar mill. The account goes on to say:—

'There is comparatively little difference in the sucrose and purity of canes from different plots according to the factory sample, whereas there is a great difference between the different plots acccording to the laboratory samples.

'As additional data along this line, four samples were taken from each of two plots, passed through the handmill and the juice analysed. In the first set of samples, there was a variation of 6·2 per cent. sucrose and 14·5 points in purity, and a variation of 2·3 per cent. sucrose and 6 points purity in the second set.'

The author concludes that in view of these results we must regard with suspicion any general deductions made from results obtained by passing small samples of sugar-cane through a hand-mill.

SUGAR AND THE COST OF LIVING.

The reduced *per capita* consumption of sugar in the United States is dealt with in a somewhat apposite way in the *American Sugar Industry* (June 1913).

It is maintained that it is the general high cost of living that has operated to keep the *per capita* consumption from increasing more than it has, and not the tariff nor the cost of production. In other words it is shown that it is the cost of the different commodities that enter along with sugar into the preparation of most of the articles of ordinary diet rather than the cost of the sugar itself. A common article of diet—cake—is taken as an example. Cake may be classed as a luxury. Sugar enters very largely into the making of this form of food, but so do many other agricultural products. If a call for retrenchment comes, a food like cake is likely to be one of the articles cut off. But this decrease is not due to the sugar.

The United States Department of Commerce have published statistics showing that the average working man has to pay 50 per cent. more for food at the present time than he did fifteen years ago. With reference to the subject of the consumption of cake, the figures show that the cost of eggs and butter have each increased 105·2 per cent. and 63·6 per cent. respectively, whereas the cost of sugar has increased only 2·9 per cent. Even milk and flour have increased 40·2 per cent. and 26·8 per cent. respectively. Hence it seems fairly evident that the decreased consumption *per capita* of sugar is limited by the cost of other articles with which it is consumed in large quantities rather than by the price of the commodity itself.

FRUITS AND FRUIT TREES.

THE COMPOSITION OF TROPICAL FRUITS.

With the exception of the few data available concerning citrus fruits, the banana, and the pine-apple, practically no systematic work has in the past been carried out in studying the chemical composition of tropical fruits. The usefulness of such work, apart from its scientific interest, is that it enables those fruit growers who produce high grade or distinctive varieties, to bring the fact before the public in a concrete and irrefutable manner. In other words, it would appear desirable, under certain circumstances, to advertise the fact in the open market in order to create a special demand.

The paper which serves the basis of the figures given at the end of this article was prepared by D. S. Pratt and J. I del Rosario and published in the *Philippine Journal of Science* for February 1913. Dealing in a general manner with the composition of fruits and their characteristics, the authors point out first of all that the individual odour and taste are dependent upon the presence of traces of compound ethers and esters present in amounts that in most cases preclude identification, but which are very important in making the fruit palatable. Fruits also contain a group of substances called pectin and pectose, the exact nature of which has not yet been definitely determined. The latter gives to unripe fruits their characteristic hardness and indigestibility. During the course of ripening, insoluble pectose is gradually transformed into soluble pectin—a carbohydrate related to starch and sugar. Pectin gelatinizes upon boiling, and fruit, rich in this peculiar class of compounds may be utilized for making jelly, since it is upon them that the setting power of the juice depends.

The nutritive value of fruits lies chiefly in the sugars present, although the acids and salts exercise an important function in the digestive processes. A high water content, with correspondingly low percentages of proteins, carbohydrates, and fats, indicates a much less important place for fruits in a dietary than they actually deserve. For instance, fruits contain a relatively high amount of iron which has a tonic action, and it must also be remembered that fruits supply a bulk and exert a beneficial laxative tendency. In warm climates, especially, sound ripe fruits should form a part of the daily food of the people.

The table which follows has been compiled from results given in the publication acknowledged above, and it serves to indicate the difference in regard to chemical composition between the common tropical fruits, which it is feared are frequently hastily consumed in large numbers with little cognizance of the amount of nutriment they contain.

Name.	Average weight of fruit, grams.	Edible portion, per cent.	Total solids.	Insoluble solids.	Protein.	Total sugars as invert.	Total acidity as sulphuric.
Carabao mango	240	73	17·2	2·6	0·22	13·24	0·14
Pahutan mango	85	60	25·7	8·1	1·12	17·54	0·25
Sapodilla plum	50	85	27·5	11·2	0·51	13·94	0·05
Cashew	88	90	14·0	2·5	0·71	10·41	0·23
Pine-apple	800	50	13·8	2·1	0·44	9·41	0·60
Shaddock	930	61	12·3	2·6	0·66	9·15	0·81
Papaya, female	1,350	47	10·5	1·6	0·44	5·97	0·11
Papaya, hermaphrodite	900	63	10·4	1·5	0·50	5·90	0·12
Melon	770	75	5·2	0·8	0·24	3·31	0·08
Watermelon	2,250	51	8·7	0·4	0·60	70·4	0·02
Tamarind, ripe pulp	—	50	82·2	8·8	3·00	41·20	9·36
Mangosteen	100	31	19·8	1·9	0·50	17·48	0·37
Guava	45	83	24·2	16·0	1·38	7·54	0·32
Soursop	650	69	22·6	3·4	0·38	18·80	0·74

An apparently satisfactory way of preserving timber is by means of the simple process of charring. According to the *Gardener's Chronicle* (July 19, 1913) a practical test has shown the satisfactory nature of this treatment. The charring process is easily and cheaply carried out by lighting a fire of wood and placing over the flame a portion of each post which is to be treated. This is done by supporting each end of the post on a large stone or block of wood at the required height. The wood should not be merely surface scorched, but thoroughly burnt to, say, ¾ inch in depth. The effect of this treatment is not only to provide an outer protective covering, but also to force the tannin and other products inwards, thus effectually sealing up the inner layers of wood and preventing fungus and insect attacks.

AGRICULTURE IN THE EAST.

METHODS IN JAVA.

When the Directors of a large Plantation Company visit their estates and then, at a meeting of the shareholders, express their views and the impressions they have received, it may well be anticipated that something is to be learnt concerning agricultural methods and finance. This has just happened in the case of a recent meeting in London of the Anglo-Dutch Plantations of Java (Ltd.), an account of which is given in *The Times* (July 26, 1913). In so far as this account serves to throw light on progressive agricultural methods in Java, it has been used to constitute the basis of the following article.

GRAFTING CINCHONA.

After referring to matters of depreciation, and to the appropriation between capital and revenue of the cost of some of the cultivations, the article goes on to consider in detail the position on the estates in regard to the cultivation of cinchona. It is pointed out that a factor of importance is that the bark of the branches, the stem and the roots of this tree are all utilized for the production of quinine, but that this commodity is not like coffee or rubber, where the product is taken from the tree and the tree goes on just the same afterwards: the cinchona tree is exhausted by cutting it down by degrees. On the estates in Java under consideration, two seed gardens have been established which contain trees with almost as high a percentage of quinine as any in existence in the world. There is, however, this danger with cinchona of such high percentage—it is very delicate in growth; hence it has been found necessary to do a great deal of grafting of this delicate kind on hardier and more robust stock. In Java, the crop is harvested for about 10·86c. per half-kilo., and the average price obtained in 1912 was 25c. per half-kilo net.

COST OF PRODUCING A POUND OF TEA.

One of the most promising industries on these estates is that of tea cultivation. The yield per acre worked out at 1,206 ℔., and the cost price was 2·89*d.* per ℔. f.o.b. It is noted that, in a general way, a rise in price is more important in regard to tea than a falling off of a little of the product.

COFFEE GROWN WITH RUBBER.

Dealing next with coffee, it is stated that Liberia and Robusta are the chief varieties grown. Hevea rubber is planted between the coffee. Although the Liberian crop already established gives good returns, that planted in recent years has not proved a great success, for the reason, it is thought, that the seed has come from stocks many degrees removed from the original Liberia. Robusta coffee on these estates appears to have somewhat disappointed expectations too. It is stated that the cost price of the double planting of Hevea and coffee is approximately £16 per acre, inclusive of their proportion of buildings and general expenses—apparently a very moderate amount.

RUBBER: FALL IN PRICE: SUGGESTED REMEDIES.

Most of the rubber grown on the estates is Ficus and Ceara. There is always a demand for Ficus rubber, but if the price continues to fall it will soon make it unprofitable to tap. Hevea is also grown. The cost of production for Hevea and Ficus, taken together, amounts to 2*s.* 5½*d.* per ℔. It is remarked that this may seem unreasonably high, but that the following reasons adequately explain the high cost (1) the old trees had, in the past, received very bad treatment at the hands of inexperienced tappers; (2) the state of upkeep in years previous to the commencement of the present ownership was far from satisfactory; whilst (3) the above figure includes the cost of upkeep of areas containing trees not yet productive.

Continuing considerations in regard to the falling price of rubber, the view is expressed that although the perpetual drop appears to be alarming investors, in some ways it would be for the future benefit of the industry; there must be some limit to the perpetual extensions, and the danger signal which is now being hoisted, though very unpleasant to contemplate at present, will in all probability make the industry a more healthy one in the future. It is suggested that the crying necessity is for plantation Para rubber producers to investigate and find out whether the higher price ruling for wild Para is only based on unfounded opinion and blind prejudice; and, if it is, to make a strenuous effort to dispel the illusion. If the difference in price is due to a defective treatment of the latex itself, determined efforts must be made to bring Eastern methods into line with those employed in Brazil.

SUGAR AFTER RICE.

Although some sugar is cultivated on these Javanese estates, an extensive industry is hampered by difficulties connected with its rotation with the rice crop, which the natives much prefer to grow. It is stated that, in Java, sugar should not be grown on new irrigated rice fields—at least three or four crops of rice must be taken off them previously. Coming to rice, in particular, difficulties again have to be faced in regard to the natives. At the same time it is likely that the revenue from this source will materially increase as the European administrators belonging to the company get into closer contact with the labouring classes

A TEAK AUCTION SALE.

The article deals lastly with a valuable asset to many estates in Java, namely, teak. Formerly this wood was employed on the Anglo-Dutch plantations for constructing buildings; now it is sold, and it provides a valuable source of revenue. The timber is disposed of in the following interesting manner: The company fells the wood, and periodical auctions are held. The teak is sold at these sales by the Government auctioneer, the selling charge being 1 per cent. of the gross revenue, and the Government is responsible for the solvency of the buyer. At one of the more recent of these auctions, wood was bought to the value of £2,000. The auctions are held at three railway stations, and the timber is floated down the river to a landing stage conveniently situated near by.

CINEMATOGRAPH SHOWS.

In conclusion one or two interesting points may be added in regard to affairs of general administration. A certain amount of labour unrest exists in Java. This, to some extent, is to be philosophically regarded in the Tropics (as in Europe) as a concomitant of prosperity: the higher the wages the greater the desire for further increases. However, companies operating in Java endeavour to dissipate any puerile dissatisfaction and unrest by the provision of amusements and entertainments, which include periodic fêtes and cinematograph shows. It is stated that at one of these fêtes a native was seen in possession of a model of an aeroplane hoisted on a pole, to demonstrate the fact that the production of the estate he worked on was continually mounting higher and higher.

COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date August 11, with reference to the sales of West Indian Sea Island cotton:—

Since our last report an extensive business has been done in West Indian Sea Island cotton at easier prices. About 1,500 or 1,600 bales have been sold, including Barbados 18*d.* to 20*d.*, St.Kitts 16½*d.* to 18*d.*, Antigua 18*d.*, St.Martin and Anguilla 16*d.* to 17½*d.*, Barbuda 16*d.* to 16¼*d.*, Nevis 16*d.* to 17*d.*, St.Croix 16*d.* to 17*d.* and Jamaica 15½*d.* to 16*d.*

The larger buyers, recognizing that planters could not hold their cotton in Liverpool indefinitely, resolved to purchase to stock, although they have not any improved demand for yarn, but they naturally were not prepared to purchase in such large quantities except at a concession. Seeing the condition of the market and the state of the fine trade generally, we think the sales are quite satisfactory.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending August 9, is as follows:—

We quote,

Extra Fine	28c. to 29c.	= 16*d.* to 16½*d.*	c.i.f., & 5 per cent.
Fully Fine	26c. to 27c.	= 14¾*d.* to 15¼*d.*	,, ,, ,, ,,
Fine	25c.	= 14¼*d.*	,, ,, ,, ,,
Extra Fine off in preparation	24c. to 26c.	= 13½*d.* to 14½*d.*	,, ,, ,, ,,
Fully Fine off in preparation	22c.	= 12½*d.*	,, ,, ,, ,,
Fine off in preparation	20c.	= 11½*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre up to August 9, 1913, were 2,977 bales, 7,381 bales, and 4,820 bales, respectively.

Bending Cotton Plants for Protective Purposes.—Interesting facts are presented in *The Board of Trade Journal* (July 17, 1913) concerning the cultivation of cotton in Columbia. 'Bogotano' is considered to be the superior variety. It has a long-staple lint and a very large boll. The fibre is yellowish. The shrubs, which grow to a height of 10 feet, last from two to three years.

The variety called 'pajarito', which is usually grown in the hot coastal districts, is cultivated in a somewhat remarkable manner. It is customary to bend over the stock some 1 to 2 feet above the soil about a fortnight to a month before the harvest, so that the plant leans right over and yet draws sufficient sap for its growth. This is done in order to preserve the cotton shrubs from being uprooted by the very violent winds which prevail from January to April, and especially, also, to hasten the breaking open of the pods, and thereby the harvest, and to facilitate gathering. The only disadvantage is that the cotton naturally becomes rather dirtier than when left to grow erect.

WEST INDIAN OILS

ACTION OF BAY OIL ON LEAD.

In view of the increasing attention directed towards the commercial production of bay oil in certain islands of the West Indies, and in view of the information published in a former issue of this journal concerning reports on the inferior quality of West Indian bay oil compared with oil distilled in Germany, the following observations recently forwarded by Mr. H. A Tempany, B.Sc., F.I.C., are of considerable interest and importance:—

On several occasions the circumstance has been reported that the distillation of bay oil from bay leaves is accompanied by the production of small and varying amounts of a black greasy substance, which appear in the receiver together with the bay oil and water.

It was at first thought that this might be due to accidental contamination with heavy mineral oil residues; in view of the fact that stills are not infrequently constructed from mineral oil drums, the explanation did not appear unlikely.

In the systematic distillation trials which have been in progress at Montserrat for some time past, the appearance of small quantities of this black grease was observed with considerable regularity. With the idea that accidental contamination was going on, precautions were taken to guard against its occurrence, but, in spite of this, the production of small amounts of the material continued.

It therefore appeared necessary to seek for some other explanation of the circumstance.

The worm-tube condenser used in the experiments had been constructed locally and was fitted with a coil made of ½-inch lead pipe. It seemed possible that the production of the black grease might be explained by the interaction of bay oil and the lead of the condenser coil.

To test this hypothesis, samples of the substance were examined in the Government Laboratory for the Leeward Islands and found to contain considerable amounts of lead.

Subsequently it was discovered that the lead coil of the condenser had become considerably corroded in places.

To obtain further information on the subject, a mixture of bay oil and water was boiled with small pieces of lead for some hours in a flask fitted with a reflux condenser. At the end of that time it was found that the bay oil itself had darkened considerably in colour, and the pieces of lead had become coated with a film of black grease similar in appearance to that already encountered.

In order to ascertain whether action of this description was to be anticipated with other metals, similar experiments were tried, using strips of copper and tin, respectively, but in neither case was an effect of this description observed.

Bay oils normally contain a high percentage of eugenol—a substance which possesses the power to unite and form compounds with metallic oxides. The appearances observed are no doubt due to the contamination of this substance with hydrated lead oxide formed on the interior of the coil by the action of air and steam.

The principal importance of these observations lies in the fact that it seems certain that the use of lead coils in worm-tubes employed in bay oil distillation should be avoided, since they are apt to lead to loss of oil and contamination; and also, they do not last.

Coils of copper or block tin are apparently free from these objections, and on this account they are to be preferred.

AGRICULTURAL ENGINEERING.

THE EFFICIENCY OF MANUAL LABOUR IN DIFFERENT OPERATIONS.

The researches of Max Ringelmann, which are described in the *Annales de L' Institute National Agronomique*, (2^e Série, Tome XII) under the title of Researches sur les Moteurs Animès Travail de l' Homme, may be drawn upon with advantage for information on the subject of the effectual utilization of human labour in different mechanical operations.

The investigator referred to, obtained the assistance of a large number of students for the purpose of conducting experiments on them to determine the maximum effort which men are able to exert under the conditions to be described later.

The first series of experiments may be conveniently referred to from the point of view of the general conclusions that may be drawn from them. The trials consisted in the exertion of a pulling force on a dynamometer. It was found that the nature of the ground surface made a great difference, and it is noted that in inclining the body for the purpose of pulling, no simple friction is produced on the soil, but rather what may be termed an anchorage (*ancrage*) resulting from the inclination of the sole. But the essential result obtained was this: that in employing men (and also animals) the best utilization is realized only when the motor works alone; since when one joins together two or several motors, useful work diminishes by reason of the lack of simultaneousness in their efforts.

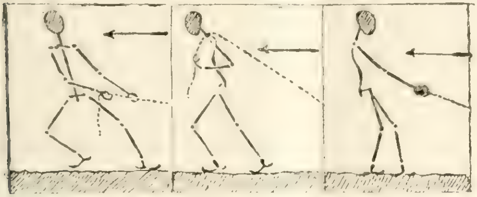

FIG. 12.

Turning now to the tests in regard to different operations, the first one consisted in pulling a rope laterally with two hands, against pulling a rope passed over the shoulders. The maximum effort exercised was for (1), 138·33 ℔., and for (2), 90·55 ℔. The next test was (3) pulling on a crossbar attached to the end of a rope, against (4) pulling it behind the back. The result was for (3), 187·70 ℔., and for (4), 126·85 ℔. After this, the students had to try pulling on a rope passed around the shoulder (5), against pulling in the same way but facing the resistance (6). The result of this exhibition of strength was, for (5), 122·63 ℔, and for (6), 135·54 ℔. A third trial (7) in this same series, was pulling in a similar manner to that adopted in (6), except that the rope was passed around the small of the back. This proved most efficient, 152·33 ℔. being the result.

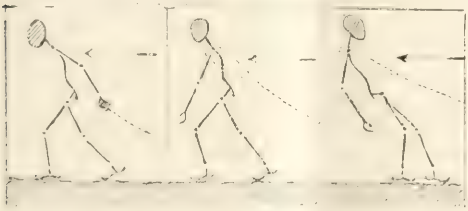

FIG. 13.

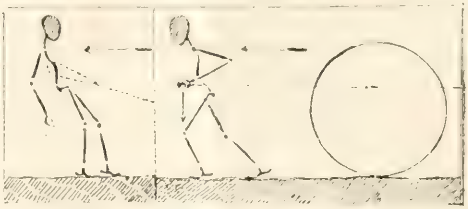

FIG. 14.

The subjects under experiment were then attached individually to a two-wheeled cart. In this series, the contest was between (8) pushing against a weighted crossbar at the end of the single shaft pole, and (9) doing the same, but aided by passing a rope attached to the shaft, around the shoulder; and, thirdly, (10) pushing instead of pulling the cart as in (8). The results were as follows: (8), 176 ℔. (about); (9), 187·84 ℔.; (10), 123·02 ℔. An alteration in the weight of the bar did not make much difference, but when more than one motor was employed there was a notable loss of effective power. For instance, two men working together as in (8) exerted a combined effort much less than the total of their exertions when operating singly. This is clearly indicated in the following table:—

	Total,	Per man,	Per man working singly.
	℔.	℔.	℔.
Two men working as in (8)	314·95	157·48	176·88
,, ,, ,, ,, ,, (9)	338·98	169·49	187·84

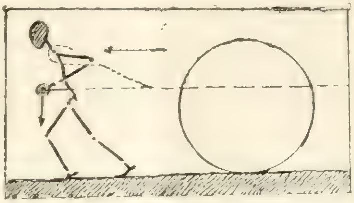

FIG. 15.

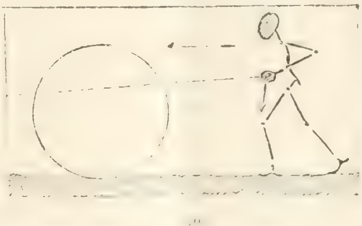

FIG. 16.

This account will be continued in the next issue of the *Agricultural News*, when consideration will be given to the practical application of these and similar results in tropical agriculture.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents and not to the Department.

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Agricultural News

Vol. XII. SATURDAY, AUGUST 30, 1913. No. 296.

NOTES AND COMMENTS.

Contents of Present Issue.

The leading article in this number deals with current topics in the rubber industry, particular reference being made to recent announcements in regard to the discovery of new uses for the commodity.

On page 276 will be found an article containing a table which shows the chemical composition of common tropical fruits.

Under the general heading of Agriculture in the East, on page 277, appears an article describing agricultural methods in Java.

Insect Notes, in this issue, on page 282, continue the account of recent work on the control of sugar-cane pests in British Guiana.

Under the caption Departmental Reports, a popular account is presented concerning investigations conducted at the Hawaii Experiment Station.

On page 279, will be found an illustrated article presenting interesting information in regard to the efficiency of manual labour in different operations.

Fungus Notes, on page 286, deal with mycological work in Southern Nigeria.

Competitions at the Fourth International Rubber Exhibition.

Several references have been made in these columns to the above forthcoming exhibition, which is to be held at the Royal Agricultural Hall, London. It will be open to the public from June 24 to July 9, 1914.

A circular, which contains a list of the competitions, has recently been received. The President's Trophy will be presented for the exhibit proving the greatest interest in connexion with the production, preparation or use of rubber in any form. The West India Committee are offering three silver cups, one for rubber and the others for general exhibits. A trophy for British-grown cotton is to be awarded by the Director of the Imperial Institute, whilst the Committee of the Rubber Growers' Association have decided to present medals for commercial samples of different forms of prepared rubber, and medals together with, (in certain cases) prizes of £50 for improvements in regard to collection and preparation, and the discovery of new uses for the product. In connexion with this latter feature of the competitions, prizes of 75 guineas and 25 guineas are being offered by the Mincing Lane Tea and Rubber Share Brookers' Association, Ltd., London. It is emphasized that only practical ideas, accompanied if possible by models, are required.

The Planters' Association of Ceylon is offering a trophy, as is also the Association des Planteurs de Caoutchouc, Antwerp.

Of the leading rubber journals who are taking part may be mentioned the *India Rubber World* (New York), which is offering a silver cup valued at $1,000, and the *India Rubber Journal*, (London), which has decided to present several £25 prizes for essays, photographic work, etc., connected with rubber production. *Grenier's Rubber News* (F.M.S.) is offering valuable silver trophies, whilst *Tropical Life* is presenting gold medals and certificates for exhibits of rubber, fibres, coffee, etc. There are several German and French competitions too.

◆

State Protection of Wild Plants.

As Recorder of the Plant Protection Section of the Selbourne Society, Mr. A. R. Horwood regards, as might be expected, the State protection of wild plants entirely from the scientific, in contra-distinction to the economic or agricultural point of view. He quite rightly points out in *Science Progress*, for April 1913, that in England, and in other thickly populated communities where either industrial development or the intensive nature of agriculture are increasing, the indigenous flora, and particularly the plant communities, are rapidly disappearing in proportion. The factors at work in this respect are as follows: smoke; atmospheric abnormalities; drainage; cutting down of woods; dessication; drought; cultivation; building operations; sport; hawking and collecting rare species: professional collection; nature study operations.

The gradual extinction which these factors bring about causes national scientific loss as regards living records and possibilities of œcological studies; whilst there is no less a depreciation in the country's natural beauty. In so far as the exterminating forces can be arrested without detriment to normal economic development, action should be taken to do so.

But the subject has another side. Wild plants act as hosts to certain parasites of cultivated plants. Wild plants, also,—particularly mesophytes and hydrophytes—occupy useful land. Also there is the spread of weeds to be considered. In the West Indies examples of these points are afforded in the cases of root diseases of permanent crops, froghopper attacks on the sugar-cane, forest land in islands awaiting further development, and the spread of weeds like the Mexican poppy, and parasites like dodder and mistletoe.

Regarded broadly, the subject is interesting and instructive, and is well worth consideration in the West Indies. Here inconsiderate extension of cultivated areas is harmful in regard to forest land and water-supply, and in the direction of spoiling natural features of interest which tend to attract visitors. The primeval forest in the Virgin Islands is a case to be borne in mind in both these connexions. Some restraint might be exercised in many places as regards the unnecessary erection of buildings in areas of scientific or even of merely artistic interest.

The Watering of Plants.

Some suggestive considerations in regard to the above subject appear in the form of a leading article in the *Gardener's Chronicle* for July 12, 1913.

The amount of water which any particular plant requires depends partly upon its composition, but chiefly upon its biological characteristics. In regard to the roots of plants, it has to be borne in mind that a saturated soil is as fatal to health as a dry one. In applying water it has also to be remembered that a relation exists between the amount of water necessary and the state of the plant. It is possible, for example, to prevent plants from flowering by supplying them continuously with plenty of water. Even more interesting is the circumstance that both light watering and heavy watering produce no difference as regards increase in yield. This fact has been proved by investigations at the French Natural School of Horticulture. At first sight, it might seem a matter of indifference as to what time of the day watering is done. The chief scientific explanation of the well-established prejudice against watering in the sun is that the addition of water to a hot soil disengages a considerable quantity of heat—particularly in clay soils containing a large proportion of organic matter. This may often bring about serious damage to the roots. When plants are grown under glass, and, to some extent, under shade, it is possible to control water requirements by regulating the amount of moisture in the atmosphere. In the case of glass-houses, this can be done by spraying the leaves. Incidentally, it may be noted that this question of humidity is a factor of considerable importance in cacao cultivation.

Referring again to the question of the effect of watering upon the temperature of the soil, observations made in the West Indies seem to point in the opposite direction to those already noted. In considering the subject of watering of plants in general, it is always well to bear in mind the difference between this way of applying moisture and its normal receipt in the form of rain. A characteristic feature which distinguishes the addition of water to the soil is that, in the artificial supply, a great deal is wasted by surface flow, by evaporation, and by horizontal diffusion in the soil.

The World's Production and Consumption of Mineral Manures.

The International Institute of Agriculture has recently issued a comprehensive statistical account of the above subject, under the title of Production et Consommation des Engrais Chimiques dans le Monde. The chief feature of general interest is the maps showing by means of numbered and coloured circular areas the relative consumption and output in different countries. It is interesting to note, in regard to production, that the chief mineral phosphate-producing regions, are in order, the south-eastern United States, Tunis, France, Algeria, Hungary, the South Sea islands, the West Indies (Rodonda) and Russia. Nitrate of soda, of course, comes entirely from Chile. Sulphate of ammonia is produced chiefly in Germany, England and France. Guano, as is well known, comes from the islands off the coast of Peru. Perhaps the most striking fact is the enormous output of potash manures from Germany. Not only is this output greater than that of any other mineral manure, but it is restricted entirely to Germany. Crude saltpetre, however, which contains potash as well as nitrogen, comes from India. Synthetic manures—nitrate of lime, calcium cyanamide etc.—are manufactured in Norway and Sweden, Italy, Austria, the United States and Canada.

The most intensive consumption per acre of mineral manures goes on in Belgium and Holland. These countries are followed by a group, composed of Germany, England, France, Australia, the south-eastern United States, and Italy; then come the north-eastern United States Austria, Spain, Algeria and Tunis, Borneo, Japan, Scandinavia, and Ireland. The next degree of decrease in intensity characterizes that remaining part of the North American continent not referred to above. In Argentina, Chile, Russia, India and Arabia the intensity of consumption is still lower than in Canada.

Unfortunately the consumption throughout the tropical zone has not been determined, with the exception of that for northern Australia, India, Borneo and Mauritius.

Figures showing the importations into the West Indian islands are given however; for instance, Trinidad and Tobago imported during 1911 mineral manures valued at 653,495 francs; whilst for Barbados the figures for the same year are given as 2,665,037 francs. The figures for the past ten years, in the case of each Colony, exhibit great variation.

INSECT NOTES.

SUGAR-CANE PESTS IN BRITISH GUIANA.

In the last issue of this journal, the first article on the above subject concluded with a reference to the small moth borer (*Diatraea* spp.), and the collection of its caterpillars and chrysalides. The subject is now continued in regard to egg collection. The number recorded for the year, from five estates was 281,181.

On one estate, as many as 8,000 egg clusters were gathered in a single day. The figures given for two estates show that in each case there are two periods during the year when the collections are at their greatest. These are in January, February and March, and in August, September and October. It is stated that these are the times when there are large areas of young canes through which the collecting gangs can work; also that these times correspond to the periods of greatest egg-laying.

METHOD OF COLLECTING EGGS.

The collection of eggs is strongly recommended as being capable of development into an effective means of controlling the small moth borer. Not only may thousands of caterpillars be destroyed without having any opportunity to damage the canes in the least, but this may be done in such a manner as not to interfere with the development of the egg parasites. The following procedure is the one generally adopted: The egg clusters are collected on small pieces of leaf, and each day's catch is taken to the factory yard or watch house where they are kept for four or five days in suitable vessels (such as small saucepans or skillets), which can be stood over, or in molasses or oil and water to prevent the access of ants or the escape of any caterpillars which may have hatched. The covers of the vessels should not be closed so tightly as to prevent the caterpillars from crawling out, otherwise they would feed upon the pieces of cane, and incidentally would destroy the eggs and all the parasites which might be contained in them.

NATURAL ENEMIES SET FREE.

The portions of cane, with the egg clusters on them, are taken to the cane field and placed in receptacles, protected from the weather, and so arranged that the parasites may escape but without allowing the caterpillars to do so. This is accomplished by using a tobacco or cigarette tin soldered in the middle of a shallow pan 5 or 6 inches in diameter. The tobacco tin receives the egg clusters on the portions of cane leaf, while the pan holds water and oil to prevent the caterpillars from getting out.

This arrangement of a tin in a pan is placed in the field inside a box nailed to a sharp stake about 4 feet high, which can be easily driven into the ground. The box is open on one side to allow the parasites to fly out, and the open side is turned to leeward so that the rain will not be driven in by the wind.

IMPORTANCE OF CANE SELECTION.

Traplights have been tried but they have not been very successful. In addition to the cutting out of dead hearts and the collecting of egg clusters,—methods which are strongly recommended—attention is given to indirect aids to control, prominent among which are: (1) the production of healthy vigorous growing canes, and (2) the use of resistant varieties.

The first of these important objects is to be achieved by careful selection of tops for planting, and stumps for supplying, to guard against the use of any plant material affected by insects, especially borers. The system at present in vogue is stated not to be rigid enough; that is, sufficient care is not exercised to see that the very best tops *only* are used for planting. Selection is important in order to ensure the right start of a healthy plant. To maintain this condition of healthfulness all the operations of drainage, tillage, weeding and manuring must be given careful attention also.

BOURBON CANE RESISTANT.

The discussion of the second of these indirect aids—the use of varieties of cane resistant to moth borer attack—brings out the fact that in British Guiana, the Bourbon cane is less attacked by the small moth borer than are many of the seedling varieties. The author of the report suggests that if the fungoid diseases could be controlled so as to allow the re-establishment of the Bourbon on a large scale, the losses due to moth borer would be greatly reduced.

FURTHER SUGGESTIONS.

It is also strongly advised not to burn the canes. The reason for this is because large quantities of trash, of value as a source of humus in the soil would be wasted, and large numbers of useful parasitic insects destroyed at the same time.

It is further suggested that there should be less ratooning or, if possible, none at all. Ratoon canes suffer more from attacks of the small moth borer than plant canes.

In addition to the egg parasites, *Trichogramma pretiosa* and an unindentified species, there are, in British Guiana, at least two hymenopterous parasites of the caterpillar, which deposit eggs in the moth borer tunnels close to the borer after having stung it and rendered it helpless. Thus when the egg of the parasite hatches, its grub at once begins feeding on the borer.

TERMITES AND OTHER PESTS.

The wood ants or termites are stated to come next to the small moth borer in point of severity of attack, and the amount of loss occasioned.

These insects infest the cane underground. When young plants are attacked, a large amount of supplying is often necessary, and when the older ripening canes are troubled, often the entire stool is destroyed. The removal and burning of the termite nests after the canes are reaped is recommended as the principal means of checking the pests, and it is stated that when the insects are particularly abundant, the flooding of the fields for a few days is a very effective mode of destruction. The practice of flooding is also recommended as a remedial measure in connexion with other cane pests, and appears to be worthy of much more extended employment.

The weevil borer (*Metamasius* [Sphenophorus] *hemipterus*) was present on all estates but abundant on only a few; This insect attacks the stools after the canes have been cut, it also infests plant tops in the ground, and growing canes that are injured by rats or the moth borer.

Other insects, the occurrence of which is mentioned, are: the coco-nut palm weevil (*Rhynchophorus palmarum*); the hard back beetles *Dyscinetus bidentatus* and *Cyclocephala signata*; the shot borer (*Xyleborus* sp.); the sugar-cane aspidiotus (*Aspidiotus sacchari*); the pink mealy-bug (*Pseudococcus calceolariae*). A leaf hopper and a froghopper (*Tomaspis* sp.) were observed in very small numbers. The cane stool moth, the larva of which feeds on decaying and damaged cane stools, the dead cane moth (*Monodes agrotina*) and several leaf-eating caterpillars, such as *Remigia repanda*, *Laphygma frugiperda* and *Lycophotia infecta* are also recorded.

A YEAR'S WORK IN HAWAII.

It is seldom that the investigation work conducted at the Experiment Station in Hawaii lacks originality and fails to serve a useful purpose. The truth of this remark is seen in the report on the Agricultural Experiment Station, 1912. The lengthy summary of investigations carried on during the year begins by giving an account of various improvements introduced in regard to the buildings and the grounds.

INGENIOUS IMPROVEMENTS.

Two interesting innovations have been, first, a glass house constructed on pillars standing in water, which prevents the entrance of ants; and the second, the provision of an arrangement for providing bottom heat in the main propagating bed by means of circulating water which is heated by sunlight in an outside tank. In regard to the grounds, a useful measure has been the retention of 2 acres of particularly dry land for employment in the testing of drought-resistant qualities of certain grasses, fodder plants and cottons.

DEMONSTRATION FARMS.

The station runs demonstration farms in order to convince the planter as to the most satisfactory methods of cultivation. Amongst other things they are shown, practically, the proper planting distance for bananas in different localities; whilst in another place, particularly suited to dairying, an equipment has been secured for demonstrating the proper way to manufacture butter. In this connexion it is hoped, in time, to bring the various dairymen together for the purpose of ultimately establishing among them a co-operative dairy association.

In the same way, the cultivation of rubber has been brought systematically before the eyes of the planters. Attention in this respect has been given principally to the use of intercrops between rubber, and to the planting of Ceara cuttings from the most heavily yielding trees. Considerable work is being done in connexion with tapping, whilst in regard to the preparation of Ceara rubber, it has been found that the impurities in the coagulum are reduced in percentage, in proportion as the pressure is increased between the rollers of the mangling machines.

WORK ON FRUIT FLIES AND MOSQUITOES.

Not less interesting are the entomological investigations carried on during the year. Efforts have been chiefly directed to the study of the Mediterranean fruit fly, mosquitoes and certain parasites, such as the cotton boll worm, algaroba bean weevils, and scale insects. Practical work in combating the first named pest has been carried on under the auspices of the Territorial Government. In regard to mosquitoes, it has been discovered that the yellow fever mosquito was much less common than (Stegomyia) *Aedes scutularis*, although the latter species was apparently introduced into Hawaii later than the yellow fever insect. Much useful information has been collected with reference to the situation under which the larvae breed.

REGULATING UNIFORMITY IN FRUIT.

Studies have been continued as regards methods of propagating the avocado and the mango, and it has been found that these fruits may be inarched or budded almost with as much facility as is known to be the case with fruits of temperate climates. Hence the difficulties which had hitherto made the propagation of superior varieties of avocados and mangoes uncertain, are rapidly disappearing. Similarly, good work appears to have been done in regard to the regulation of uniformity in Papayas. As regards bananas, the shipment of these fruits to the chief market in California is hampered by quarantine restrictions, but it is hoped that the steamship companies will arrange to carry the fruit without packing. This would render inspection more effective and convenient.

PINE-APPLES AND MANGANESE.

Reference has been made from time to time in this journal to the chemical investigations conducted in Hawaii. It may be remembered that one of the chief lines of work carried on by the chemical department has been a study of the function and the distribution of manganese in soils. The work of the Station on manganese soils is being closely followed by pine-apple growers. It appears impossible by any method so far adopted to grow pine-apples successfully on soils which contain more than 2 per cent. of manganese: not only do the leaves turn decidedly yellow or even whitish, but the fruits are pink rather than of the normal colour, and are too acid or otherwise disagreeable in flavour. In selecting new areas for the extension of the pine-apple industry, prospective growers have had the manganese determinations made in order to avoid the areas in which a high percentage of manganese is found.

A POSSIBLE REMEDY.

Evidence is accumulating of the importance of a reasonable balance between lime and magnesia in the soils of Hawaii. Since the chief injurious effect of manganese seems to be in causing plants to absorb too much lime and too little magnesia, a systematic set of experiments has been planned to determine whether the effects of manganese can be overcome by adding magnesia to such soils. The results of this work will be awaited with interest.

A NEW FERTILIZER.

A further very useful piece of research has revealed the fact that the pulp of sisal hemp (which is usually thrown away after the extraction of the fibre) is a valuable fertilizer. Sisal removes large quantities of mineral plant food from the soil. Another striking discovery was the determination of lactic acid as the normal vegetable acid of sisal. The percentage of acid increases from the base to the tip of the leaf. It might be worth while extracting it provided the corroding action on machinery were overcome by using gun metal in the place of iron.

CHICLE GUM IN RUBBER LATEX.

Amongst the miscellaneous chemical researches were the studies which led to the conclusion that sulphate of ammonia is the best nitrogenous manure for the taro crop, and that which showed that the new rubber product from *Euphorbia laurifolia* can be coagulated only by using heat or alcohol. An interesting fact is, that the dry matter of the latex of this plant contains 14 to 17 per cent. of rubber and about 60 per cent. of resin, which appears to be nearly if not quite identical with chicle gum.

GLEANINGS.

In Antigua, during July, a considerable amount of nursery work was carried out in connexion with the raising of forest and other trees.

In St. Kitts, the reaping of the old cane crop was finished in the Basseterre district by the end of July, but in the northern district the estates were said not to be so well advanced owing to labour troubles.

The condition of the lime crop in Dominica is stated to be normal, but late. The rainfall during the month (July) at the Botanic Garden was 7·54 inches. The heaviest precipitation occurred on July 31, when 1·24 inches of rain fell.

The prospects of the cacao crop in St. Lucia are, on the whole, good. The lime crop is also in a satisfactory condition. Crushing has been begun, but the completion of the lime factory awaits the arrival of that portion of the plant ordered in England.

The Curator of the Experiment Station, Tortola, has forwarded a list of articles sent from the Virgin Islands to the National Exhibition held at Toronto. These include principally specimens of cacao, cotton, sugar and starches. Articles of fancy work were also forwarded.

It is stated in the *Cuba Review* (July 1913), that Professor East, of Harvard, has succeeded in producing a hybrid tobacco by crossing Sumatra and Havana varieties, which yields a much larger percentage of smoking material of better quality than either of these two produces by itself.

A note in the *Westminster Gazette* (July 8, 1913) calls attention to the fact that, until five years ago the banana was scarcely known in Germany. To-day, it has become an article of ordinary diet. The largest firm in Dusseldorf sells about 600 bunches per week in the winter, and from 800 to 1,000 in summer.

The leading article in the *Port-of-Spain Gazette* (August 3, 1913) deals with the subject of the proposed College of Tropical Agriculture for Trinidad. Reference is made to the recent meeting in London (already noticed in this journal), and sympathetic agreement is expressed with the views put forward by the chief speakers.

Dealing with the subject of the cultivation of coco-nuts, the *Journal of the Jamaica Agricultural Society* emphasizes the facts that care must be taken not to plant too close nor pick immature nuts for market; whilst the seedling must be provided with a good large hole, and growth and development must be accompanied by systematic cultivation and proper methods of sanitation.

According to the Grenada *Government Gazette* (July 15, 1913), a considerable increase has occurred in regard to the value of the total quantity of cacao exported from that island during the six months ended June 1913, compared with the corresponding months in the year 1912. An increase is also shown in the case of cotton, though the quantity shipped during the 1913 period was less than that exported during the same term for 1912. The value of the spices exported has also increased.

A traveller in Louisiana—according to the *Review of Economic Entomology*—says the best way to get rid of mosquitoes is to take a piece of camphor about one-third the size of a hen's egg, place it in a tin and hang it over an ordinary oil lamp. Care must be taken, of course, that the camphor does not take fire. The vapour is said to have effectively prevented mosquitoes from entering the house, even when the windows were opened. The only disadvantage to this procedure, it may be added, in the West Indies, is that camphor costs (retail) some 6*s*. per lb.

The attention of those interested in soya beans may be directed to a comprehensive account of the cultivation and utilization of this crop published in the Annual Report (1911) of the Trades Commissioner for the Union of South Africa. In this it is stated, that at the Government Experimental Farm in South Africa, over eighty varieties have been tested, and as high as 2,000 lb. per acre was recorded, whilst in many instances, the yield was well over 1,000 lb. per acre. In Manchuria, where this crop is grown chiefly, the yield per acre is from 1,100 to 1,600 lb.

The Dominica *Government Gazette* (August 8, 1913) contains an article written by Dr. H. A. Alford Nicholls, C.M.G., on the subject of hurricanes. As is pointed out, a circumstance to be borne in mind is that, although meteorological intelligence is forwarded to the West Indian islands by cable, this is usually available—particularly in Dominica—only to those living in the immediate vicinity of the port. Hence the information which is contained in the article referred to should receive the careful attention of those living away from the town, though it is hoped that there will be no opportunity for readers to test the information in person.

A correspondent to the *Agricultural Gazette of New South Wales* (June 1913) makes the following useful suggestion in regard to supplying lime to cows: This consists in occasionally feeding the animals with pulverized bone or bone meal mixed with a liquid bran mash. Another method is to cause the animals to lick bran and salt with which the bone meal is mixed. Care must be taken to see that the bone meal is obtained from a reliable source, so that there will not be any possibility of introducing disease, for instance, tuberculosis (see *Agricultural News*, Vol. XII, p. 165). The planter might take extra precaution by pouring boiling water on the bone meal before use.

STUDENTS' CORNER.

SEPTEMBER.

First Period.

Seasonal Notes.

REVIEWING THE SEASON'S COTTON PRICES.

At this time of the year the intermediate and final student will derive benefit by referring back to the notes on West Indian cotton in the past numbers of the current volume of the *Agricultural News*, with a view to tracing the rise and fall of cotton prices in England and the United States. A useful procedure would be to plot the values on squared paper, making the units of the vertical axis pence, and those of the horizontal axis, the dates at which these prices ruled. Four graphs should be plotted: (1) St. Vincent (superfine) cotton; (2) General (fine) Sea Island cotton; (3) Extra Fine American Sea Island; and (4) Fully Fine American Sea Island.

As regards West Indian cotton, a steady rise will be observed to have occurred during March. There was a drop towards the end of April, however, and a steady fall of general West Indian during May and June. Superfine Sea Island will be seen to have remained very firm during the past three or four months, and on June 30 some bales were sold at 30*d.* per ℔. About that time, however, some medium West Indian Sea Island dropped below the American Extra Fine value (16*d.* per ℔. on June 17). This, however, appears to have been the only occasion when West Indian and American prices have touched.

USEFULNESS OF GRAPHS.

While speaking of graphs, it may be suggested that the student should employ this form of record more generally than is the usual custom on the estate. Plotted curves are simple, and make very small demands as regards time and trouble. They show relations and tendencies far more clearly than figures in a list or table, and they can always be conveniently extended from time to time, and be easily filed for future reference.

Those who are unacquainted with the details of graphical methods should purchase the small handbook on the subject by Hall and Stevens. (Price 1*s.*)

THE RISE OF WATER IN SOILS AND PLANTS.

Turning from these economic considerations to others connected with agricultural chemistry, an interesting reflection is to contrast the difference between the rise of water in the soil and that in a growing plant. In each case water ascends at different rates according to the kind of soil, and according to the kind of plant. This can be shown by conducting experiments by means of the simple, home-made apparatus shown in Figs. 17 and 18. Details concerning the working of this apparatus must be obtained from local sources, or from a book on elementary agricultural chemistry: (*Nature Teaching* would be a suitable source to refer to).

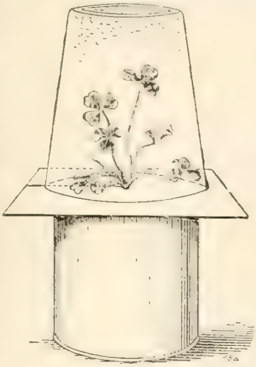

Fig. 17. Water Rises in a Plant—

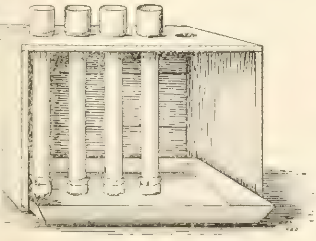

Fig. 18. And also in the Soil.

Although the rate of the rise of moisture varies in soils and plants, it is probably a much simpler phenomenon in the soil, being in this case almost entirely the effect of surface tension. In the plant, capillarity is certainly one factor involved in the ascent of sap; but there is also the influence of the stomata in the leaves and morphological features, together with the varying densities of the fluid contents of the cells. In other words, osmotic pressure and the general individuality of the plant have to be considered. Do not forget, however, that recent researches have shown that osmosis occurs in soils as well as in plants. (See *Agricultural News*, current volume, p. 120.)

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) What do you know concerning the physical and chemical composition of soils suitable for rubber growing?

(2) Name a useful mixture for spraying cacao thrips. How would you proceed to make it, and to apply it?

INTERMEDIATE QUESTIONS.

(1) Discuss calcium cyanamide (a) as a manure, (b) as an insecticide, (c) as regards its manufacture.

(2) Describe in non-technical terms, any practical application of Mendelism you are acquainted with.

FINAL QUESTIONS.

(1) Discuss manganese as a soil constituent. Compare its action with that of iron.

(2) State your views in regard to the disinfection of hides. To what extent does (a) the island you live in, (b) the West Indies, export these articles?

Soil Temperature in Its Relation to Plant Growth.—The following interesting account of a paper on this subject, taken from the *Experiment Station Record* (July 1913) is of interest in connexion with observations of a somewhat similar nature made some time ago in the West Indies:—

'This article [under review] gives investigations on the above subject, discussing particularly soil temperature as a plant biological and geographical factor, the relation of soil temperature to phenological phenomena, the influence of geographical position and sea-level upon vegetation and soil temperature, and the relation of the coming of spring to a temperature of 10°C. in the soil and the duration of sunshine. The author concludes that there is a direct relation between soil temperature and the coming of spring. A deficiency of 1°C. in the average soil temperature at depths of from $\frac{1}{2}$ to 1 metre in March and April delays spring ten days. The blooming of apples coincides closely with the appearance of a temperature of 10°C. in the soil at a depth of $\frac{1}{2}$-metre. A decrease in the average daily duration of sunshine of one hour during the winter lowers the temperature of the soil during March and April 3°C. and delays spring one month.'

In the Tropics, of course, this seasonal influence does not exist to the same extent. It may be noted, however, that in the West Indies, an annual variation of a few degrees occurs in regard to soil temperature in the so-called winter and summer months; but of course, the main factor affecting the stimulation of growth is the amount of moisture present.

FUNGUS NOTES.

MYCOLOGICAL WORK IN SOUTHERN NIGERIA.

A considerable part of the Annual Report on the Agricultural Department for Southern Nigeria, 1912, is devoted to an account of the field investigations conducted in the Protectorate during the past year by the Government Mycologist, Mr. C. O. Farquharson, M.A., B.Sc.

It is observed, first of all, that the fungus flora so far examined of economic plants in Southern Nigeria is very similar to that of Southern India, Ceylon, Malaya, Java and the East generally.

RUBBER DISEASES.

The most important diseases attacking rubber trees appear to be *Fomes semitostus*, Berk , and *Hymenocheate noxia*, Berk., both of which have been found on the roots of *Hevea brasiliensis*. The former organism is capable of travelling through the soil from root to root, hence it is of prime importance to get rid of all infected material. The soil should also be treated with quick lime, and a circular trench should be dug at some distance from the diseased tree to check the advance of the mycelium. Decaying bush stumps must be destroyed.

The parasite known as *Hymenocheate noxia* is not regarded in Southern Nigeria as being less serious than the above-mentioned organism. At the same time it is admitted that this fungus cannot spread through the soil like Fomes, and it is therefore dependent for its spread on pre-existing infected material. In this connexion it is well to bear in mind that the rapid root growth of the Para rubber tree soon takes complete possession of the soil in a plantation, and hence if one tree becomes infected, the fungus has a chance of running along what may be metaphorically regarded as a complex system of railway lines.

The stem disease of Para rubber, known as pink disease, caused by *Corticium salmonicolor*, B. and Br., has been identified. It generally attacks at the fork, and in consequence, the whole crown very often dies. The fungus is not believed to be a wound parasite.

DISEASES OF CACAO.

It is stated next that root disease (*Hymenocheate noxia*, Berk.) is fairly common on cacao trees in the Protectorate, whilst one undoubted case of *Fomes semitostus*, Berk , has been found in the Agege district. The well-known canker disease of the stem of cacao trees is frequently to be observed. The question as to whether the causative organism is really *Phytophthora Faberi*, Maubl., or *Spicaria colorans*, is not entered into. The fact, however, is emphasized, that apart from the uncertainty as regards the specific parasitism of the two species just referred to, there is undoubtedly another fungus at work in Southern Nigeria, which produces effects very similar to the group of symptoms denominated by the term 'canker'. The author regards this latter parasitism as the most serious menace to cacao in the Colony. A full description of the disease will be published in due course.

As regards pod diseases, *Thyridaria tarda*, Bancroft (brown rot), and *Nectria bainii*, Massee., have both been noted; whilst anthracnose, caused by *Colletotrichum theobromae*, Delacroix, has also been observed.

DISEASES OF COTTON.

Possibly the most interesting feature of the report under consideration are the remarks presented in regard to the pathology of cotton in West Africa. 'Sore shin' (seedling disease) has been frequently observed; but the disease does not seem to be induced by any specific organism.

For convenience, the chief diseases attacking cotton are treated under two heads: those affecting American, and those harmful to the so-called native cotton.

The American diseases are believed to be merely physiological. Red rust is an example of a disease which is not caused by a parasite. When in this condition, the leaves of the plants turn reddish-purple in colour, and soon fall off. The malady appears to be correlated with climatic conditions. After referring next to the undoubted occurrence of a good deal of natural crossing between the American and the native cotton, the importance of selection of 'proof' varieties receives attention. It appears that red rust is particularly severe on crosses between the two continental strains. A curious disease, of obscure origin, is referred to under the name of leaf 'sport' of cotton. Amongst other diseases of leaves and fruits observed were areolate mildew, caused by *Ramularia areolia*, Atk., cotton anthracnose, induced by *Colletotrichum gossipii*, Southw. A species of Diplodia, which is believed to be identical with one on cacao pods has been found occasionally causing decomposition of the boll. Cotton rust is of wide distribution.

In concluding the report, attention is given to the diseases of native cotton. The chief one is that which is designated 'leaf curl'. It is remarked that the term 'disease' is somewhat misleading, as the particular state referred to is more of an abnormality than a strictly morbid condition. Space does not allow of a detailed account of the symptoms given, but the whole effect may be described as a curious puckering and yellowing of the veins, and lamina in general. No cause can be ascribed to this disease. It is, however, under investigation.

BEYOND THE MICROSCOPE.

Another pathological condition that has been investigated is a blackening of the midrib and main veins of the leaves, accompanied by the formation of a waxy substance, which was found to contain bacteria and a Fusarium It is still uncertain which of the two agencies causes the disease. This malady has not been found on any of the American cotton, but it is somewhat remarkable that it has been noted on Brazilian cotton. 'Leaf curl', on the other hand, does not affect the Brazilian type. It is noteworthy that Brazilian cotton bears several botanical characteristics suggesting a relationship with the native variety. It is believed that the modern conception of biological forms of fungi (notably in regard to the parasitism of the rusts and mildews) seems to find illuminating additions in the case of these cotton diseases in Southern Nigeria.

There is much in biology that lies beyond the microscope.

A note appears in the *Experiment Station Record* (July 1913) referring to some recent observations carried out by Bateson in the Federated Malay States in regard to the possible occurrence of a bacterial disease of Hevea.

A specimen was found which did not seem to be infected with any of the common root or stem diseases. The wood of this tree was discoloured to a depth of about 1 inch, the outer portions being dark brown. The manager of the estate from which the tree was obtained, stated that the leaves on the lower branches died suddenly, as though they had been scorched by fire. This condition spread rapidly, and within three days all the leaves on the tree were dead. The malady is possibly induced by bacteria.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

The Report of Mr. J. R. Jackson is as follows:—

Business in Mincing Lane, not only in drugs and spices but in general produce also, has been of a normal character for the season of the year. July and August being the chief holiday months, very little business is anticipated, and the month under review, has passed with very few exceptions to the rule, either in the extent of business, or in prices realized, the exceptions being a plentiful supply of Cassia Fistula at the beginning of the month, and a consequent decline in the prices realized. Mace also, in the middle of the month dropped from 1*d.* to 2*d* per ℔. on previous prices. The following are the details affecting West Indian products.

GINGER.

At the first spice auction on the 2nd of the month the offerings amounted to 531 bags and 14 cases, all of which were bought in at the following rates. Brown rough Calicut, good medium and bold 38*s.* medium part shrivelled 35*s.*, limed cut tips 40*s.*, and washed rough Cochin 29*s.* to 30*s.*, per cwt. A week later namely on the 9th a few sales of Calicut were effected. Cut tips fetching 32*s.* 6*d*, and bright cuttings 35*s.* Bold was bought in at 85*s.*, medium at 65*s.* and small cut at 42*s.* 6*d.* Brown rough Calicut was also bought in at 35*s.* and washed rough Cochin at 30*s.*

NUTMEGS AND MACE.

The first sale of the month opened on the 2nd with 201 packages West Indian nutmegs which were sold at the following rates: 66's, 5¼*d.*, 80's to 90's, 4½d. to 5*d.*, 92's to 98's, 4½*d.* to 4¾*d.*, 100's to 110's, 4½*d.* to 5*d.*, and 147's, 5*d.* These prices were from ¼*d.* to ½*d.* lower than previous prices. On the 10th of the month the sales amounted to 650 packages of West Indian, which opened at easier rates, but later became steadier. On the 23rd, 805 packages were brought forward and sold, 60's to 67's fetching 5*d.* to 8½*d.*, 70's to 80's, 5*d.* to 6½*d.*, 81's to 90's 4½*d.* to 5¼*d.*, 104's to 114's, 4¼*d.* to 5*d*, 126's to 136's, 4¼*d.* to 4¾*d.* and 145's and 164's, 4½*d.* Thirty-four packages of Eastern were also disposed of at the following rates: 58's to 68's, 7*d.* to 9*d*, 78's to 95's, 5*d.* to 5½*d.* and 110's 4¾*d.* At the last auction on the 30th 114 packages West Indian were offered and sold at prices varying but slightly from the preceding

Mace was represented at the first spice auction on the 2nd of the month by 64 packages of West Indian, all but one of which sold, fair to good reddish fetching 2*s.* 2*d.* to 2*s.* 3*d.* per ℔., dark red 2*s* to 2*s.* 1*d.* and broken 1*s.* 6*d.* to 1*s.* 10*d.*; on the 9th of the month 213 packages of West Indian were brought forward, 200 of which sold at 1*d.* to 2*d.* lower, for mixed sorts, while good to fine realized full prices; fair to pale fetching 2*s.* 5*d.* to 2*s.* 6*d.*, pale and reddish 2*s.* 2*d.* to 2*s.* 3*d.* and dark to fair reddish 1*s.* 11*d.* to 2*s.* 1*d.* and broken 1*s.* 6*d.* to 1*s.* 9*d.* per ℔. At the auction on the 23rd the offerings amounted to 199 packages of West Indian all of which sold at from 1*s.* 9*d.* to 2*s.* 5*d.* for fair and broken at 1*s.* 5*d.* to 1*s.* 7*d.* per ℔. At the last sale on the 30th only 29 packages of West Indian were offered and sold at prices varying but slightly from those of the previous week.

SARSAPARILLA.

At the first drug auction on the 10th sarsaparilla was almost a neglected commodity, native Jamaica being the only kind represented, and this only by 12 packages, none of which, however, found buyers, the whole being bought in at 8*d.* to 10*d.* per ℔. for ordinary pale red and yellow. It was stated that privately 2*s.* per ℔. was asked for a limited quantity of grey Jamaica, and the same price for Lima. At auction on the 24th, the offerings were as follows: grey Jamaica 20 bales, native Jamaica 37 bales, and Lima Jamaica 3 bales. The whole of the former were disposed of, fair to good fibrous fetching 1*s.* 8*d.* to 1*s.* 10*d.* per ℔., 1*s.* 7*d.* for ordinary roughish, and 1*s.* 4*d.* to 1*s* 6*d.* for sea damaged. Of the 37 bales of native Jamaica only 3 were disposed of, good red realizing 10*d.* per ℔. and fair red press packed 8*d.* The 3 bales of Lima Jamaica were unsold.

CASSIA FISTULA, OIL OF LIME, ANNATTO SEED AND TAMARINDS.

In the early part of the month it was reported that East Indian cassia fistula was both cheap and abundant, 15*s* 6*d.* per cwt. being the price quoted for good quality; at auction on the 24th, 14 packages were offered, but 4 only found buyers at 17*s.* 6*d.* per cwt. for good stout West Indian. It was reported at the beginning of the month that the supplies of distilled oil of lime was becoming rapidly exhausted at 3*s.* per ℔. At the close of the month, however, 2*s.* 9*d.* was the price quoted for good West Indian distilled, at the drug auction on the 10th 49 bags of fair bright coconada annatto seed were brought forward and the whole disposed of, fair bright fetching 4*d.* to 4⅛*d.*, and country damaged 3*d.* to 3¾*d.* per ℔. At auction on the 9th, 11 barrels of tamarinds from Montserrat were offered and sold at 14*s.* per cwt. for fair darkish in bond. At the last auction 48 packages of West Indian were brought forward, 7 only of which found buyers at the same rate for dry Montserrat namely 14*s.* per cwt. Twelve packages of fair juicy Barbados were bought in at 17*s.* in bond. East Indian were reported to be exceedingly scarce.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture is expected to arrive in Barbados, from duty leave in England, on October 6, 1913.

Mr. P. T. Saunders, M.R.C.V.S., Veterinary Officer to the Department, returned to Barbados, from St. Vincent and the Leeward Islands, on August 20, 1913.

Mr. W. Robson, Curator of the Botanic Station, Montserrat, arrived in Barbados on August 25 by the R. M. S. 'Trent', *en route* for Montserrat after three months' leave of absence spent in England.

It is stated in the *Voice of St. Lucia* (July 5, 1913) that the Agricultural Superintendent in that island conducted the examination during 1912 in the primary schools of the Presidency. The examiner urges that more practical work should be done, and that the scholars be given opportunities to do things, and not only hear about them.

MARKET REPORTS.

London.—The West India Committee Circular, August 12, 1913; Messrs. E. A. de Pass & Co., August 1, 1913.

Arrowroot—3[illegible].
Balata—Sheet, 2/10; block, 2/- per ℔.
Beeswax—No quotations.
Cacao—Trinidad, 70/- to 77/- per cwt.; Grenada, 64/- to 69/-; Jamaica, 63/- to 68/6.
Coffee—Jamaica, 56/- to 62/-.
Copra—West Indian, £33 per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 15½*d.* to 20*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Very quiet, 37/- to 62/- per cwt.
Isinglass—No quotations.
Honey—30/- to 37/6.
Lime Juice—Raw, no quotations; concentrated, £25; otto of limes (hand-pressed), 15/.
Logwood—No quotations.
Mace—1/11 to 2/6.
Nutmegs—4½*d.* to 4¾*d.*
Pimento—Quiet, 2⅛*d.* to 2⅜*d.*
Rubber—Para, fine hard, 3/9; fine soft, no quotations; Castilloa, 2/4 per ℔.
Rum—Jamaica, 2/4 to 6/- per gallon.

New York.—Messrs. Gillespie Bros. & Co., August 8, 1913.

Cacao—Caracas, 14c. to 15c.; Grenada, 14c. to 14¼c; Trinidad, 14c. to 14½c.; Jamaica, 12c. to 14c.
Coco-nuts—Trinidad and Jamaica, selects, $39·00 to $41·00; culls, $26·00 to $27·00 per M.
Coffee—Jamaica, 10c. to 13c. per ℔.
Ginger—7½c. to 10½c. per ℔.
Goat Skins—Jamaica, 50c.; Antigua and Barbados, 46c. to 48c.; St. Thomas and St. Kitts, 43c. to 45c. per ℔.
Grape Fruit—Jamaica, $2·00 to $3·50.
Limes—$2·00 to $4·50
Mace—46c. to 53c. per ℔.
Nutmegs—110's, 12c.
Oranges—Jamaica, $1·00 to $1·75
Pimento—4¼c. per ℔.
Sugar—Centrifugals, 96°, 3·73c. per ℔.; Muscovados, 89°, 3·23c.; Molasses, 89°, 2·98c. per ℔., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., August 18, 1913.

Cacao—Venezuelan, no quotations; Trinidad, $14·00 to $14·75.
Coco-nut Oil—$1·31 per Imperial gallon.
Coffee—Venezuelan, 15½c. per ℔.
Copra—$5·25 per 100 ℔.
Dhal—$4·75 to $5·00
Onions—$1·75c. to $2·00 per 100 ℔.
Peas, Split—$6·20 to $6·25 per bag.
Potatoes—English, $1·75 to $2·20 per 100 ℔.
Rice—Yellow, $5·45 to $5·50; White, $5·30 to $[illegible] per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., August 23, 1913; Messrs. T. S. Garraway & Co., August 16, 1913.

Arrowroot—$6·00 to $7·00 per 100 ℔.
Cacao—$15·00 per 100 ℔.
Coco-nuts—$18·00
Hay—$1·50 per 100 ℔.
Manures—Nitrate of soda, $70·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $82·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$2·25 to $3·00 per 100 ℔.
Peas, Split—$5·00 to $5·50 per bag of 210 ℔.; Canada, $4·00 per bag of 120 ℔.
Potatoes—Nova Scotia, $3·00 to $3·75 per 160 ℔.
Rice—Ballam, $5·10 to $5·40 per 190 ℔.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $4·00 per 100 ℔.

British Guiana.—Messrs. Wieting & Richter, August 16, 1913; Messrs. Sandbach, Parker & Co., August 15, 1913.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	8c. per ℔.	——
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per ℔.	——
Cacao—Native	12c. per ℔.	13c. per ℔.
Cassava—	60c.	——
Cassava Starch—	$4·00 to $5·00	——
Coco-nuts—	$16 to $20 per M.	$10 to $16 per M.
Coffee—Creole	16c. per ℔.	17c. per ℔.
Jamaica and Rio	16c. per ℔.	17c. per ℔.
Liberian	13½c. to 14c. per ℔.	12c. per ℔.
Dhal—	$4·40 per bag of 168 ℔.	$4·75 per bag of 168 ℔.
Green Dhal	$5·00	——
Eddoes—	$1·32	——
Molasses—Yellow	None	——
Onions—Teneriffe	3½c.	4c.
Madeira	5c.	4½c. to 5c.
Peas—Split	$6·25 per bag (210 ℔.)	$7·00 per bag (210 ℔.)
Marseilles	——	——
Plantains—	10c. to 32c.	——
Potatoes—Nova Scotia	$2·75 to $3·00	$2·75
Lisbon	——	$1·20
Potatoes-Sweet, B'bados	$1·44 to $1·68 per bag	——
Rice—Ballam	No quotation	——
Creole	$4·75 to $5·00	$5·00
Tannias—	$1·56	——
Yams—White	$3·00	——
Buck	$1·92	——
Sugar—Dark crystals	$2·35 to $2·40	$2·25 to $2·30
Yellow	$2·55 to $2·60	$2·40 to $2·45
White	$3·75 to $4·00	$4·00
Molasses	$2·00	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
.. Cordwood	$1·80 to $2·00 per ton	——

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FOR THE WEST INDIES.

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PAMPHLET SERIES.

The Pamphlets are written in a simple and popular manner and the information contained in them is especially adapted to West Indian conditions. They contain, amongst other subjects, summaries of the results of the experiment work on sugar-cane and manures, the full official reports of which have only a limited circulation. The number issued up to the present time is seventy. Those mentioned in the following list are still available: the rest are out of print.

SUGAR INDUSTRY.

Seedling and other Canes at Barbados
in 1900. No, 3, price 2*d*.; in 1901, No. 13, price 4*d*.;
in 1902, No. 19, price 4*d*.; in 1903, No. 26, price 4*d*.;
in 1904, No. 32, price 4*d*.
Seedling Canes and Manurial Experiments at Barbados,
in 1903-5, No. 40, price 6*d*.; in 1904-6, No. 44, price 6*d*.;
in 1905-7, No. 49, price 6*d*.; in 1906-8, No. 59, price 6*d*.;
in 1907-9, No. 62, price 6*d*.; No. 66, price 6*d*.
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in 1904-5, No. 39, price 4*d*.; in 1905-6, No. 46, price 4*d*.;
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in 1908-9, No. 63, price 6*d*.; in 1909-10, No. 67, price 6*d*.
Manurial Experiments with Sugar-cane in the Leeward Islands,
in 1902-3, No. 30 price 4*d*.; in 1903-4, No. 36, price 4*d*.;
in 1904-5, No. 42, price 4*d*.; in 1905-6, No. 47, price 4*d*.;
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in 1908-9, No. 64, price 4*d*.; in 1909-10, No. 68, price 4*d*.
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Demand for Agricultural Literature.

THE chief difficulty which promoters of agricultural progress have had to face has always been to use a popular phrase—the difficulty of 'getting at' the people. Unlike that of most other industries, agricultural work is scattered; there is little opportunity for personal intercourse, and representative meetings can only be brought about by those interested making considerable sacrifices as regards time and trouble, and not infrequently as regards money also. It has become a problem, then, amongst the various Departments and other institutions interested in agricultural advancement, to say exactly how information and advice can be most satisfactorily disseminated. The appointment of instructors and inspectors has been one line of action that has been taken for the diffusion of knowledge and advice: It is a line which is undergoing considerable development, for it has been found that practical demonstration is more certain to impress than a mere written description, and that a quiet conversation and the discussion in a common-sense way of the pros and cons of any case in which improvement is desired, will lead quicker to more concrete results than correspondence and printed articles.

Although in many of its aspects, the advice of inspectors and the information of instructors calls for a great deal of support, it is generally the case that an efficient staff of this kind is out of the question in most places owing to the high degree of expenditure which it involves. So that under most circumstances the diffusion of knowledge in agriculture depends upon other agencies, the most important of which is the issuing of publications.

The reason for approaching this subject has really arisen through the announcement of suggested changes in the plans of the Secretary of Agriculture of the United States, as regards that Department's publications. The matter has been dealt with in some detail on another page in this issue. The point which the announcement raises is a very important one, and it is this: that in the indiscriminate publication and distribution of agricultural literature there must necessarily be a great deal of waste. Even amongst publications of a very practical kind this will occur.

To a fruit-grower, for instance, publications dealing, say, with cattle feeding, are of little concern. Of much less interest will a description of the methods and results of scientific research be found, mainly because the lay reader is unable to understand their meaning and significance. It will be seen that a waste of this kind does not occur where a Department, by means of travelling officers, is in close contact with the agriculturist. But it need not occur either, as regards contact by means of publications if things are properly thought out, and the distribution organized to meet the demands of different sections of the community. After all agricultural publications are food for thought just as meat and bread are food for the body. This is an age of quick feeding and economies, and things must be easily digested.

This tendency has been a part-cause of a movement in the direction of popularizing agricultural science, and provided due accuracy and system be retained, good results should be effected by it. The expression of scientific results in popular terms leads to an increase in the number of individuals interested in the subject, and the matters find a satisfactory reception. On the other hand, it must be remembered that the popularizing of science is at best but a palliative, for it does not tend to encourage education, since it helps to make things go on easier without it.

This leads to the consideration of an interesting aspect of the influence of publications in agriculture—their educational influence and their effects as regards the mere provision of facts.

Although in their own way invaluable for purposes of reference, and for enabling investigators to keep 'up-to-date', the value of such publications as the *Experiment Station Record*, the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* and, as a third example, the *Review of Economic Entomology* —the value of journals like these is not so much educational as instructional. The same criticism applies to some extent, even to journals which make no pretence to be scientific. For example, many of the Australian agricultural publications, and, to come nearer home, the *Journal of the Jamaica Agricultural Society*. These set out to provide the planter with solid facts so that he can stand, as it were, in the middle of the field with the journal in one hand and point with the other until the described operation is brought to a close. There is no occasion to think and no risk of going wrong. It is admittedly useful; but it is, or should be, only part of a system. And that is what the United States Department sees. As well as scientific summaries, scientific papers and farmer's bulletins, there should be publications which have a broadening effect upon the mind, the function of which is to circulate new ideas and bring forward little-known customs obtaining in other parts of the world. The modification of the *Yearbook* into a volume of popular articles of the magazine type is a recent admission of this necessity.

At the risk of creating a wrong impression, reference may, in the present connexion, be made to the editorial policy of the *Agricultural News*. This policy has always been educational. Not infrequently criticisms have been levelled at it, to the effect that the greater portion of matter in this journal is taken from contemporary sources. The same objection would obviously apply to those summarizing publications referred to above, whence the criticism is reduced to the extreme of absurdity. However, as a positive defence, constant effort is made in presenting information, to regard it from the West Indian point of view, and although this journal tells what is going on in the Tropics rather than directly what to do there, it is in this policy that what little educational value it has must lie.

There is no reason for, and every objection against, a sugar-planter restricting his reading to specialized literature like the numerous sugar journals, and the same thing applies to rubber growers and the various journals devoted to that industry. This is an age of not minding ones own business: the progressive man takes care to mind other peoples' as well. And in this respect, the different sugar and rubber journals are, in one way, of very great value since they help to reflect the market and the demand of consumers—the external economic side of agriculture which, again, it may be pointed out, the *Agricultural News* endeavours not to neglect entirely. Finally, the view may be expressed that although an agricultural journal may not be widely read by the practical man, that does not mean to say he is unaffected by it. The journal will be read by agricultural officers, in personal contact with the practical man, and the knowledge will diffuse, though it be only through the medium of casual conversation.

Summarizing the views that have been put forward above, it is seen that the dissemination of information in agriculture is more likely to be effective quickly if done verbally, but that from the extensive rather than intensive nature of rural life, this is practically impossible, particularly in the Tropics, without being supplemented by publication work. Broadly speaking, there are three distinct kinds of demand for agricultural literature: the person interested in science asks for accounts of scientific research; the purely practical man wants useful facts connected with his particular kind of industry; whilst there is a general, but limited demand for popular writings of all kinds dealing with agricultural progress. In meeting these demands care must be taken not to make things too easy, otherwise there is a tendency created which may have a retrogressive influence on rural education.

In endeavouring to reach the practical man there is no royal road: simplicity, accuracy and a light pen will make headway: but the underlying effort should be to awaken initiative on the side of the worker, after which it will be found possible to raise gradually the general standard, and to simplify many of the present systems which incur so much expense to the general public.

A STRANGE MIGRATION.

An almost unprecedented incident occurred in November 1911 in the islands off the coast of Peru. For some unaccountable reason the whole of the birds on which the deposition of guano is dependent, forsook their nests and newly hatched young. Millions of nests containing many millions of dead birds were thus forsaken. An investigation into the cause of the departure is described in *The Times* (July 25, 1913) based on the observations made by Dr. H. O. Forbes, appointed by the Peruvian Government to investigate the matter.

PROBABLE CAUSE.

It appears that shocks of earthquakes are not uncommon in these islands and the birds which live there are always greatly alarmed when such disturbance occurs It has been surmized that the cause of the present exodus was an exceptionally severe shock. It has not been possible to say in what directions the birds migrated, and although they began to return in February and March 1912, they did not resume breeding, and consequently the guano of that season was lost because a very large amount of the deposit takes place during the time of breeding.

USEFUL SPECIES.

There are about eight species of birds which are valuable as guano producers. The most important of these is Bougainville's cormorant, whose chief nesting place is the Chincha islands. Here millions of the birds breed during February.

The going and coming of the animals is said to be a marvellous spectacle, and the noise which they make is hardly less remarkable. At times the sound is like the sough of the sea, and at others it resembles the sound of a great crowd, all the members of which are talking at once. Next in importance to the bird just mentioned is the Pelican (*Pelicanus thagus*). These birds also nest in enormous flocks but do not assemble so closely as the cormorants do. In the nesting season they live in the same areas, and the two species seem to be able to exist harmoniously in close proximity. Besides this bird, there are two other species of cormorant which occur in smaller numbers but are still of considerable value. These are the sea-crow and Gaimard's cormorant. The next most important guano birds are mostly found on the Lobos island. These are two species of gannet, and together with the pelican are the chief producers of guano on these islands. Flocks of gannets numbering from 10,000 to 20,000 at a time may be seen diving and then rising high into the air. They go down like so many rockets into the sea, which is ploughed up as if a fusillade were being fired into it.

A HEALTHY APPETITE.

No less remarkable than their power of flight is the appetite of these birds. Each one will eat from 8 lb. to 10 lb. of fish a day. Dr. Forbes carried out a rather interesting experiment in which he kept a number of them in captivity and fed them to determine how much guano would be produced on a diet of a certain kind of fish. In this way it was possible to determine the total deposits for, say, four years, and from that estimate the ornithologist was able to divide the whole of the guano archipelago into zones. The idea was to protect the birds with a view to allowing them to deposit and to have a rigorous close season, in each of four years. Only one zone will be worked every year, thus leaving a period for recovery.

PRACTICAL SUGGESTIONS.

Apparently there is little fear of the birds not returning in time; but to encourage this, Dr. Forbes put forward the useful suggestion that endeavours should be made to remove the sharp points of the rocks upon which the birds alight, thereby increasing the surface area.

As well as breeding on the larger islands, the birds visit the smaller and more precipitous ones as well. The difficulty in collecting guano from such situations is obvious, but Dr. Forbes believes that an enormous new collecting area might be added to that already existing by the general adoption of the expedient proposed by him, in the case of these small and very rugged haunts.

The Adulteration of Arsenate of Lead and Paris Green.—An interesting case concerning the adulteration and misbranding of the insecticide arsenate of lead, is referred to in a Circular issued under the Insecticide Act of 1910 of the United States Department of Agriculture.

In this it is stated that the substance in question was labelled: '5 lb. net weight new process arsenate of lead—Guaranteed to contain not less than 12½ per cent. of arsenic oxide—Not more than a half of 1 per cent. water soluble arsenic—Sold for insecticide purposes.'

An analysis of specimens of the article by the United States Department of Agriculture showed that it contained arsenic in water soluble forms equivalent to more than 0·75 per cent. of arsenic oxide [As_2O_5], and that the article contained lead arsenite. Adulteration of the article was alleged in the information: (1) in that the article contained arsenic in water soluble forms equivalent to more than 0·75 per cent. of arsenic oxide, and (2) that a substance, namely lead arsenite had been mixed to injuriously effect its quality and strength. The court imposed a fine of $50 and cost.

Another instance of a similar nature recorded from the same source was a frudulent transmission in which parcels of Paris green were sold under weight.

Cases like the above will be of interest to West Indian cotton-growers and will serve as a warning against imposition in the West Indies by these particular species of fraud.

FRUIT.

FERMENTATION OF CACAO BY MECHANICAL MEANS.

In a note on the above subject in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (July 1913) the fact is remarked upon that the cacao-making industry has to deal with an extremely variable product owing to the difficulty of regulating the changes which take place during fermentation. The investigation to which the information relates had for its particular object the rendering of cacao preparation more systematic and less difficult. It is pointed out that the object of fermentation is to destroy the sweet mucilaginous pulp which adheres closely to the beans of the fruit, and to produce useful chemical changes in the kernel. It was found that present methods of fermentation could be modified with advantage by using a mechanical process for removing the pulp after a preliminary treatment of the fruit with a weak alkaline solution. The fresh beans were macerated for some hours at a temperature of 45°C. to 50°C. in a 1 per cent. solution of sodium carbonate. The mass was left in a warm, damp place until the pulp had undergone sufficient change. Although satisfactory in most ways, the process had a great disadvantage in that it provided an opportunity for the development of moulds, and for this reason fresh investigations were started with a view to sterilizing the seeds. By the simple action of steam under slight pressure, seeds were obtained which, after the pulp had been removed mechanically, presented an excellent appearance. The sterilized seeds were reduced to a powder, and by means of different kinds of tests it was concluded that it was possible to induce changes in this sterilized cacao powder in the laboratory which are almost equal to those which occur in the course of the present method of preparation as practised in the countries where cacao is grown. It is believed that cacao growers would derive considerable benefit by adopting the method experimentally at first with a view to comparing it with processes already in vogue.

PROSPECTS OF THE FRUIT GROWER IN UPPER EGYPT.

In one of the Eighteenth Dynasty temples at Karnak may be seen, carved in stone, groups of fruit trees and their produce, and here also mummified fruits are frequently found buried with the dead, demonstrating the fact that in Egypt the fruit industry was assiduously carried on, no doubt in a paying and scientific manner, 3,000 to 4,000 years ago.

At the present time the reverse is the case. Egypt neglects the cultivation of fruit. As is pointed out in the *Journal of the Royal Society of Arts* (August 1, 1913), there is little reason for this state of affairs, for in few countries are the soil and climatic conditions more favourable for the cultivation of fruits than in Upper Egypt. The land is particularly cheap, whilst labour is also plentiful and inexpensive. There are at present no pests and diseases to contend with.

It is stated that the country is particularly well adapted for the growth of the vine. This cultivation is already carried on in Upper Egypt, and is said to prove so profitable that a net yield worth over £100 per acre is not uncommon—and this from the ordinary grape vine without the aid of those scientific efforts so necessary to the production of good fruit. The conditions are also said to be ideal for citrus growing: lemons yielding two crops annually, and the demand for oranges and tangerines being far in excess of the present supply. Other fruits such as bananas, guavas, grape fruits, pine-apples, papaws and mangoes could be easily grown and disposed of at a high rate of profit, and it also pays to produce in this country sultanas, muscatels, peaches, nectarines and apricots. Muscatels are dried in the sun and pay the purchaser yearly up to £200 per acre; orange groves yield about £125 per acre. An English company is reported to be about to take up fruit farming and irrigation on a large scale, for which, at present, they are inviting financial support. In conclusion it is of interest to note that the annual imports of fresh fruits into Egypt is valued at upwards of £200,000, and of dried fruits £300,000. These latter have to pay an *ad valorem* duty of 8½ per cent.

EFFECT OF FERTILIZERS ON THE QUALITY OF CITRUS FRUITS.

It is generally admitted that citrus fruit, in common with other crops, remove certain elements from the soil, and that those must eventually be replaced if production is to be sustained at its original level. As is pointed out in an article by R. S. Cunliffe, B.Sc., in the *Cuba Magazine* (August 1913) it is not so frequently recognized that a properly balanced fertilizer has an eminently beneficial effect on the quality of the product.

In the course of the article referred to above, several tables are given in support of this action of fertilizers on quality. Table 1 presents the results obtained from an experiment with oranges on the red lands of Havana province. Plot 1 received no fertilizer. The average weight of the fruits produced was 6·1 oz. The appearance of the fruit was fair but the skin was thin, raggy, very sweet and insipid. The percentage decay thirty days after picking was 100. Plot 3, on the other hand, to which was applied, in the experiment, sulphate of ammonia, 3 lb., acid phosphate 8·5 lb., sulphate of potash 4·7 lb. gave very different results. The average weight of fruit produced was 7·9 oz. The appearance was good, skin thin, still some ragginess, juicy, sub acid-flavour, and sprightly. The percentage decay thirty days after picking was only 14.

Similar results to the above were obtained in the case of other varieties of oranges, and also with grape fruits, and the investigations appear to have established in a general way, the fact that fertilizers exert an extremely beneficial action on the keeping qualities and flavour in varieties of fruits that are naturally weak in these respects.

It is interesting to note that the writer is dubious as to the beneficial action of mulching—a form of manuring which has proved so successful in the case of cacao and also for limes in the West Indies. It is suggested that the defect as regards the keeping quality in the case of a certain variety of orange might be attributed to mulching, and the view is expressed that any tendency in this direction might be counterbalanced by the judicious application of mineral fertilizers. In conclusion, although it may be admitted that potash is the dominant ingredient in a fertilizer for bearing trees, the author is of opinion that the best results, not merely in yield but also in quality, are obtained only by a proper balance of the essential elements necessary as plant food.

Without casting any reflections on the above results, it would be of interest to know under what auspices the experiments were conducted, and the influence the results have had in connexion with practical fruit growing in Cuba and elsewhere.

VETERINARY NOTES.

COW-TESTING ASSOCIATIONS.

In view of the editorial article on the subject of the control of the milk supply in small communities in the last issue but one of this journal, Circular No. 17 published by Cornell University concerning cow-testing associations is of considerable interest. In this publication the necessity of records in the breeding of milch cows is emphasized in a general way but the most useful feature of the paper is the description of the Delhi Cow-testing Association in Delaware County. U.S.A.

Cow-testing associations may be organized in various ways, but it is essential that due regard be had to local conditions, and it is essential that a reliable painstaking officer be employed to carry on the work. In the case of this particular association, a table of figures shows that the improvement of the various herds of cows came principally through the weeding out of animals whose inferiority was revealed by the results of the tests made by the association. It is worthy of note that those herds which were made up of high yielding animals were capable of improvement as well as those in which the cows yielded much less.

As regards details of organization, it is stated that the most feasible method is for say twenty-five stock owners to form an association. Each owner must agree to weigh the milk of each cow every day, and the tester must examine the milk of each cow at least for one day of each month. The inspector himself may visit the several estates in turn and take samples, or the owners themselves may forward samples to the central station. The fat production of each cow for the month and records of food consumed, are recorded regularly and sent to the owner on special printed forms.

The apparatus required at the central station consists principally of a Babcock tester, and according to the publication under consideration the cost of this apparatus together with the wages of the inspector for one year would be about $700.

Before a cow-testing association is organized each person who intends to join should sign a definite agreement to that effect in order that they may be no misunderstanding.

In the West Indian islands the organization of a cow-testing association might best be undertaken by the agricultural societies; on the other hand, the institution might equally well be a Government one. In any case the details of organization would be the same. The greatest efficiency would result if the inspector carried on his duties under the general direction of a veterinary officer.

DANISH TUBERCULIN UNIONS.

For some time, in Denmark, the value of Professor Bang's system of tuberculosis eradication has been recognized by live stock owners. Of recent years, societies basing their regulations for membership on his principles have been founded, and the following rules are typical of their class:—

1. To become eligible for membership the farmer must have had his cattle inoculated with tuberculin.
2. He must divide his stock into two herds: one reacting, the other non-reacting.
3. He must keep the herds in distant cowsheds, and provide them with separate pasturage and attendants. If possible, they should be isolated on different farms.
4. He must thoroughly disinfect the cowsheds, troughs, and all utensils used by the non-reacting herd.
5. He must have his healthy herd inoculated with tuberculin every six months.
6. He must remove the calves of the reacting herd and feed them either on milk from the non-reacting herd or on pasteurized milk.
7. He must not add any calves to the healthy herd except those which have given non-reacting symptoms to the tuberculin test made when the calves are some days old.
8. He must not add any cattle bought at a market to the healthy herd without previously submitting them to the tuberculin test.
9. He must sterilize the milk of the tuberculous cows before using it as food, either for man or beast.
10. He must immediately get rid of the reacting animals that show clinical symptoms of the malady.

EYE WORM OF CHICKENS.

The Hawaii Agricultural Experiment Station has recently issued a Press Bulletin (No. 43) which deals with the subject of the disease of chickens known as eye worm. The malady shows itself in the form of an inflamed eye from which there is excessive tear secretion due to the presence of small thread-like worms some 10 to 18 mm. in length. The irritation may cause death in the case of very young birds.

OCCURS IN THE WEST INDIES.

The name of the particular organism which causes the disease is *Oxyspirura Mansoni*, commonly known as Manson's eye worm. It has so far been observed as a parasite only in the eye of chickens and fowls, although they are about thirty-eight species of eye worm which have been found in the eyes of forty-three different species of wild birds in different parts of the world. The species under consideration has been reported as occurring in China, Brazil, Mauritius, Jamaica, Florida and Hawaii. In all the localities so far reported on as being infested with the worm, the organism is found only near the seashore, though its wide distribution would lead one to think that it occurs in most districts in tropical countries.

REMARKABLE LIFE-HISTORY.

The life-history of *Oxyspirura Mansoni* is of a particularly interesting nature. The eggs of the worm are either laid in the eye of the chicken from which they are immediately washed into the throat by the flow of tears down the tear duct, or else they are set free in the intestines by the disintegration of mature female worms which had passed down the tear duct through the throat into the intestines.

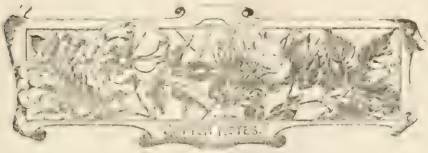
The important point to remember is that the eggs may pass out on to damp soil where they will hatch. The immature worm lives until it attains at least one-third of its mature size, when it will gain entrance to the eyes of chickens directly from the soil.

TREATMENT AND PREVENTION.

It is stated that the best treatment for the destruction of the parasite consists in anaesthetizing the eye of the chicken with a 5-per cent. solution of cocaine, and then lifting the membrane and dropping a 5-per cent. solution of creolin directly into the inner corner of the eye under the membrane.

In view of the fact that in places where the disease is common, the soil may contain thousands of the larvae of the eye worm, renders it imperative that means be taken by applying quicklime to remove the infestation from the soil.

In the case of an epidemic, the birds should be kept on dry flooring of such a nature as will permit it to be cleansed thoroughly and systematically.



WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date August 25, with reference to the sales of West Indian Sea Island cotton:—

Since our last report about 200 bales of West Indian Sea Island cotton have been sold, including Virgin Isles at 16*d.*, St. Croix 16*d.*, Tobago 16*d.* to 17*d.*, Barbados 18*d.* to 18½*d.*, and a few superfine St Vincent have also been disposed of on private terms.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending August 23, is as follows:—

We have only to renew our last quotations in the absence of any sales.

We quote,

Extra Fine	28c. to 29c.	= 16*d.* to 16½*d.*	c.i.f., & 5 per cent.
Fully Fine	26c. to 27c.	= 14¾*d.* to 15¼*d.*	,, ,, ,, ,,
Fine	25c.	= 14¼*d.*	,, ,, ,, ,,
Extra Fine off in preparation	24c. to 26c.	= 13½*d.* to 14½*d.*	,, ,, ,, ,,
Fully Fine off in preparation	22c.	= 12½*d.*	,, ,, ,, ,,
Fine off in preparation	20c.	= 11½*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre up to August 23, 1913, were 3,146 bales, 7,731 bales, and 4,823 bales, respectively.

SAKELLARIDES VERSUS SEA ISLAND COTTON.

A letter has just been received from Mr. John W. McConnel, of Manchester, with reference to the report of Messrs. Wolstenholme and Holland (June 30) published in the *Agricultural News*, Vol. XII, p. 230. This report makes reference to Sakellarides cotton, and it is recommended that in view of its great strength all planters should select Sea Island seed for fineness.

This reference to a possible competition between Sakellarides and Sea Island cotton suggested to Mr. McConnel the desirability of writing the letter referred to above. In this communication, Mr. McConnel proceeds first to point out that during his visit to the West Indies in 1911, he was frequently asked for information concerning Sakellarides cotton, and there was a good deal of alarm less this new and prolific growth in Egypt should destroy the demand for West Indian. Mr. McConnel ventured to express a different view, and to recommend planters to continue to grow good styles of West Indian Sea Island. There can be no doubt that to a large extent the experience of the last two and a half years has indicated the correctness of this view.

ALL WEST INDIAN STYLES FINER AND LONGER THAN 'SAKEL'.

In some respects, Mr. McConnel says, 'Sakel' cotton has worked almost a revolution. It apparently produces about as much lint to the acre as the inferior cottons of Egypt. It has consequently to a very large extent taken their place, and its buying price is kept down about on the same level as other Egyptian styles that will not spin so fine or so strong a yarn. It has also been used to some extent, as Messrs. Wolstenholme & Holland say, in place of poor Sea Island from America and, perhaps, also from the West Indies. But these Sea Island kinds which 'Sakel' has replaced are just the style of cotton which it seems undesirable for planters to grow in any case. Some of the cotton grown in Florida and Georgia, which is sound and well grown is perhaps not fine enough to escape the competition of 'Sakel'. But so far as Mr. McConnel has seen, all West Indian Sea Island styles are finer and longer than 'Sakel'. That is to say, they are suitable when properly grown for finer counts than those properly spun from 'Sakel'. And it is only when they are imperfect—i.e. when they are exceptionally wasty, or irregular, or wholly or in parts weak —that 'Sakel' is able to compete with them.

'SAKEL' INCREASES DEMAND FOR SUPERFINE SEA ISLAND.

Mr. McConnel's own view remains just what it was, namely: that the effect of the introduction of 'Sakel' cotton with its combination of excellence and cheapness, is to raise the entire standard of the yarns in which it can be used. And a secondary effect of this is that in the counts finer than the 'Sakel' count, users of yarn will want the standard raised as well: and as Mr. McConnel has said over and over again in the West Indies, it is just the same characteristics of brightness and strength in which the West Indian Sea Islands have excelled the Sea Islands of Carolina.

CULTIVATE FOR SOUNDNESS.

Mr. McConnel, consequently, again urges readers of this journal, not indeed to strain after exceptional fineness or length, but to cultivate for soundness, regularity and freedom from waste. These qualities will make the cotton maintain its price, and at the same time tend towards a greater production of lint, and consequently a smaller cost of production.*

At the one hundred and fourteenth meeting of the Council of the British Cotton Growing Association, reference was made to a recent visit of the Kabaka of Uganda and his party to Manchester, and a letter was read from the Secretary of State for the Colonies conveying an expression of thanks for the trouble which had been taken to make the visit of the Kabaka of Uganda an agreeable and interesting one. All concerned are confident that the visit of the Kabaka and his Chiefs will have good results in stimulating the cotton-growing industry in the Protectorate.

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*In regard to the letter dealt with above, the opinion may be expressed that the qualities of excellence to which Mr. McConnel calls attention are influenced very largely by environment and appear only when all the conditions of soil and weather are eminently favourable. An adverse season, such as may be occasioned by rains falling at inopportune times, or by insufficient precipitation, will result in irregularity, waste and weakness.

No doubt the excellence of St. Vincent and St. Kitts cotton is to a large extent dependent on the very friable and deep soils of these places.

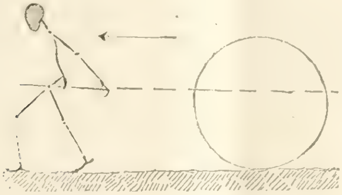
It is probable, that careful seed selection has done a very great deal to improve West Indian cotton, but however careful a planter may be, if he has a bad season, his cotton is always liable to suffer in quality. In consequence of the fact that the question raised by Mr. McConnel has already attracted considerable attention in the West Indies, it would be of interest to have the views on the subject, of other readers of this journal.—[Ed. *A.N.*]

AGRICULTURAL ENGINEERING.

THE EFFICIENCY OF MANUAL LABOUR IN DIFFERENT OPERATIONS.

It was endeavoured in the last issue of the *Agricultural News* to present as briefly as possible some of the results that Professor Max Ringelmann obtained in regard to the maximum effort exerted in different manual operations. In continuation of the subject, further series of trials will be described and a few remarks made in regard to its agricultural importance.

The third series of experiments consisted in determining the maximum effort exerted in pulling a two-wheeled cart.

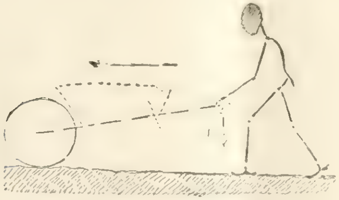


(11)

Fig. 19.

The effort exerted in pulling on the shafts with both hands (11) was 145·33 lb.; pulling with the aid of a rope 152·59 lb.; pushing the shafts 88·01 lb. The maximum efforts represented by these figures are much more feeble than in the other series described in the last article, where the cross-bar was employed. There is always a great waste of energy when pulling by means of shafts owing to the torsion of the arms at an angle of 90°.

The subjects were next involved in an experiment with an ordinary wheel-barrow. The weights represented by *p.* in the first series (12) and the results obtained were: 13·2 lb. and 103·88 lb. (maximum effort); 24·2 lb. and 111·94 lb.; 35·2 lb.



(12)

Fig. 20.

and 107·58 lb. respectively. In the second series (pulling instead of pushing) the results were as follows: 13·2 lb. and 109·82 lb.; 24·2 lb. and 116·42 lb.; 35·2 lb. and 120·38 lb., respectively. It will be noted that higher results were obtained by pulling than by pushing, but it must be remembered that, in practice, the difficulty of steering and maintaining an equilibrium when pulling, are disadvantages which tend to offset the greater power that can be exerted.

The final series consisted in pushing a trolley. The results obtained were as follows: (13) pushing 1 m. ·05 above the track level 136·88 lb.; (14) pushing 0 m. ·34 above, 110·04 lb.; (15) pushing with the foot 0 m. ·34 above, 84·22 lb. It will be noticed that the bent attitude causes the loss of much effective effort.

PRACTICAL ASPECTS OF THE SUBJECT.

When we come to consider these results, and those described in the last article in connexion with manual labour in the West Indies and Tropics generally, the first feature of interest which strikes one is the principle of combined action. This depends on the circumstance that the sum of the maximum efforts of a number of men engaged in a certain piece of work is much less than the sum of the efforts when each is working independently. The familiar habit amongst the labouring classes to sing whilst exerting combined effort is therefore seen to have a scientific basis and is to be encouraged. Another point of much significance brought out by the foregoing results, is the usefulness of a rope attachment. In pulling a cart a rope passed round the shoulder enables a man to exert a maximum effort 12 lb. greater than would be the case without one. In the West Indies, the tractive powers of men are chiefly used in connexion with the shipment of cargo. The trolley system is still in vogue on many of the island piers, whilst the hand-cart is used for conveying sugar and other produce from the warehouses. No harm can accrue by bearing in mind, in regard to these operations, the results of the tests indicated above.

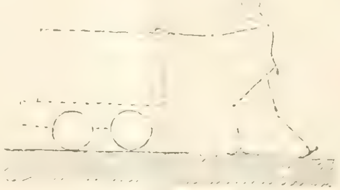


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Fig. 21.

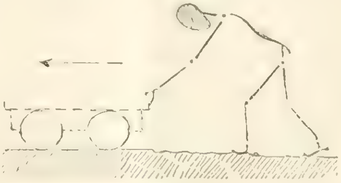

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Fig. 22.

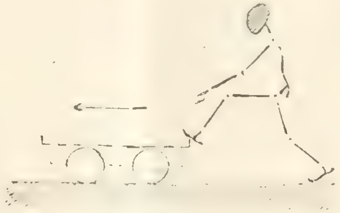

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Fig. 23.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents and not to the Department.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the demand for agricultural literature. In order to avoid waste and to increase the effectiveness of agricultural publications, attention must be given to the requirements of different sections of the community.

Under the heading of Fruit, on page 292, the effect of fertilizers on the quality of fruit, and the fermentation of cacao are dealt with, amongst other matters.

On page 293 information will be found concerning milk-supply, the eradication of tuberculosis, and a disease of the eye of chickens.

Important views regarding the competition of Sakellarides cotton with West Indian types are published under Cotton Notes, on page 294.

On page 295, the final article on the efficiency of manual labour is continued from the last issue of this journal.

Useful information is given under Insect Notes, on page 298, concerning the use of flour paste in spraying.

Under the heading of Rubber, on page 303, will found many useful facts concerning the cultivation and preparation of the Para variety.

The Problem of a Pure Milk Supply.

Professor Rosenau, of Harvard, in his recently published work on the milk question drives home the importance of the subject when he tersely states, 'The milk problem starts from the cradle and ends with the grave. Sometimes it leads to an untimely grave'. The book from which this is taken, is reviewed interestingly in *Nature* (July 31, 1913) but a statement is made in the review to which we must take exception.

In referring to the subject of the mixing of milk from several cows, the reviewer states: 'this the author says is desirable, as it furnishes a more uniform product, and tends to dilute infection if present; this the framers of Bills in this country might note.'

In a recent editorial in this journal, the desirability of mixing milks was advocated but with certain reservations. From the point of view that mixing furnishes a more uniform product, the practice is to be encouraged and agreement may be expressed with the views of *Nature* and Professor Rosenau. But as regards the dilution of infection, and particularly tuberculous infection, mixing is to be condemned. The infection is diluted it is true, but unfortunately at the same time it is more widely distributed, whilst the reproduction of the pathogenic germs in the milk will soon tend to render all infected supplies equally dangerous. And even disregarding the natural increase of the germs, it does not appear to have been demonstrated that children, for instance, are positively able to resist infection below any particular degree of intensity.

St. Vincent and Artificial Manures.

It is somewhat regrettable that Mr. F. O. Davies, of Trinidad, was unable to give a less distorted description of agricultural conditions in St. Vincent in an article on the subject recently published in the *Cuba Magazine* (August 1913). In the first place the sub-heading to the article—Sugar: Arrowroot: Cotton: Primitive methods—is misleading, in view of the fact that, in order of importance, the positions of these crops is the reverse of the above arrangement. Again, although amongst the peasantry the methods of cultivation may, in some respects, be primitive, the general organization of the cotton and arrowroot industries is a model in many ways, even to Cuba and Trinidad. A spirit of co-operation is very much in evidence in St. Vincent, and partly in consequence of this, the island can maintain the uniform production of the highest grade of cotton in the world. Furthermore the recent resolve of the St. Vincent Arrowroot Association to hold the 1913-14 crop for England at 3¼*d.* per lb. can hardly be regarded as a primitive procedure

But Mr. Davis is unacquainted with, or else ignores such facts as these. The fundamental aim of the article appears to be to increase the use of artificial fertilizers in the island. Speaking with regard to progress in the cotton industry he says: 'things ran smoothly with it [the cotton crop] for a time, but, alas, the time is come when the earth is weary with cotton, indeed in most cases exhausted, and what will it grow now?' There is no scientific foundation for such remarks.

Turning to the subject of arrowroot, the following is found: 'The crop is not always sold at 5c. per lb. the value even dropping as low as 2½c. per lb. at some times.' [No reference is made to the existence of any organization.] 'Manure for this crop, like all other crops grown, is not reckoned, on account of the value not being known as yet in the island.'

Whatever the motive underlying the article may be, its effectiveness would not have been lessened if the author had taken a rather broader, fairer, and more accurate outlook on things in St. Vincent as they really are.

Agricultural Development in the West Indies.

Put tersely, the advice given by Professor Henricksen to West Indian agricultural communities at a recent meeting of the Trinidad and Tobago Agricultural Society is: Force the Canadian market, guarantee cargo rather than provide subsidies, and improve production by methods of practical demonstration.

Professor Henricksen is of opinion that a rosy future awaits those islands with sufficient initiative to take up more extensively the cultivation of fruit, and particularly vegetables. The Canadian demand would increase provided produce were shipped continuously and advertised by a commercial agent. The most effective advertisement of all would be the preliminary waste incurred before new channels of consumption opened out. A development of West Indian horticulture would have several beneficial indirect effects as well. Horticulture necessitates and allows of intensive methods, the employment of which in the garden would tend to stimulate their adoption in the field. Garden produce also requires careful handling and quick despatch: the influence in this respect on shipping arrangements would be most desirable at the present time.

To improve agricultural production it is believed that the work of farm demonstrators would bring about useful changes quicker than second hand reports. In this connexion reference is made to American experience in Cuba, Porto Rico and Hawaii.

Publications of the United States Department of Agriculture.

Information is presented in a recent issue of *Science* (August 8, 1913) to the effect that new plans have been announced by the Secretary of Agriculture in regard to the publication work of the United States Department. The new changes will effect a general improvement and, as a secondary result, lessen waste. Hitherto the large number of Bulletins and Circulars of the various Bureaus have been issued and distributed indiscriminately. This has led to a large amount of matter being sent to certain sections of the agricultural communities not immediately interested in it, or, if they are, the matter has frequently been found too technical to be of use to the lay reader.

The most important change will be the substitution of the *Journal of Research* for the scientific bulletin system. This journal will be issued monthly and sent to those immediately interested in agricultural science. Important papers published in the *Journal of Research* may also be issued as separates.

The *Monthly Crop Reporter* will no longer be published, on the score that most of the statistical information in this publication has been too late for practical service. A *Weekly News Letter*, in typewritten facimile form, will be issued instead.

The *Experiment Station Record*, the *Weather Review* and *North American Fauna* will be published as usual.

The series of Farmer's Bulletins will be continued. The object of these is to tell the people how to do important things. The *Yearbook* will be restricted to articles of the magazine type, which, it is believed, must add greatly to the popularity and value of the volume.

Professor John Milne, F.R.S.

Professor Milne, the seismologist, died at his residence in the Isle of Wight during the night of Wednesday, July 30, at the age of sixty-two. In an obituary account of the scientist's life, *The Times* (August 1, 1913) refers to Milne's great work in Japan, where he served the Government of that country for nearly twenty years. Although by early training a geologist, Milne soon became absorbed in the scientific study of earthquakes. He founded the Seismological Society of Japan, and edited—or rather, to be more accurate—edited and wrote the *Seismological Journal*, and the *Transactions* of the Seismological Society. Milne's two volumes of a later date, on Earthquakes and Seismology have long been standard text-books.

Unfortunately the close of Milne's residence in Japan coincided with a period of deep resentment felt in that country against foreigners generally, and immediately before his departure a disastrous fire occurred at his residence at Tokio, possibly by accident, but more probably by design. The greater portion of his valuable library and collection of instruments were completely destroyed.

In July 1895, Professor Milne and his wife, a Japanese lady, arrived in England. Within a few weeks a small brick pier was erected and a pendulum installed at the end of it. This was the foundation of an observatory which, to-day, is well known in every country in the world. With characteristic energy Milne organized a net-work of recording stations chiefly in Great Britain and the Colonies, and his annual analyses enabled the scientist to determine the approximate positions of fifty-seven world-shaking earthquakes a year. Not the least important part of Milne's work was the successful attempt to determine the types of building that are best fitted to withstand the brunt of severe shocks.

In the course of his career, Professor Milne's ability received the highest recognition by the Royal Society, the Royal Geological Society and the University of Oxford. For his services to the Japanese Government, he was awarded the Third Class Order of the Rising Sun.

INSECT NOTES.

THE USE OF FLOUR PASTE IN SPRAYING.

Results of interesting experiments in the use of flour paste in connexion with spraying are described by W. B Parker in Circular No. 166 recently issued by the Bureau of Entomology of the United States Department of Agriculture.

In the belief that the information will be likely to be of interest to many of the readers of the *Agricultural News* this circular is abstracted in the present article.

FLOUR AS A 'SPREADER'.

In the course of trials to find a suitable 'spreader' for the lime-sulphur solutions used as a spray against the red spider (*Tetranychus bimaculatus*) on hops in California, it was discovered that flour paste not only answered that purpose but also seemed to serve, to a certain extent, as an active insecticide.

As a spreader it was found that when flour paste has been added to the lime-sulphur solution, it has the effect of causing the spray to adhere to the leaves as a thin film; whilst without the addition of the flour paste, the lime-sulphur sprayed on the plants in the same way, collected in drops or globules.

For this purpose the flour-paste is used at the rate of 4 gallons to 100 gallons of the lime-sulphur solution, each gallon of paste containing 1 lb. of flour.

The beneficial effect of the spreading was very considerable, for whereas the lime-sulphur spray used without the 'spreader' gave a result of only 37·5 per cent. of the mites (red spider) killed in a certain instance, it was found that with the addition of the flour paste the same strength of lime-sulphur gave results as high as 99 per cent. killed.

VALUE AS AN INSECTICIDE.

A series of trials was made with nicotine-sulphate against the hop aphis (*Phorodon humuli*) in which flour paste at the rate of 4 gallons to 100 gallons of the nicotine-sulphate solution at strengths of 1 in 2,000 and 1 in 3,000. In these trials from 99-100 per cent. of the aphides were destroyed.

During the trials it was observed that many of the smaller aphides were pasted on to the leaves. Accordingly, flour paste used without any other insecticide was tried, and it was found that when used at the rate of 8 gallons (= 8 lb. flour) in 100 gallons of water or even stronger (say 10-100 or even 12-100) most of the young and tender aphides (97 per cent.) and of the red spiders were killed, and at the same time, no damage was done to the hop plants even when in full bloom.

The older and stronger aphides, and the eggs of the red spider, were not killed by the flour paste. In this latter case, it was found necessary to make a second application, seven to ten days later, in order to reach the mites that emerge from the eggs.

COST.

In a series of five experiments against red spiders on hops with flour paste at the rate of 8-100, it was found that from 99·8 to 100 per cent. were killed. The solution costs only 17·6c. per 100 gallons.

Flour paste has been used successfully against red spiders upon the following plants: beans, chrysanthemums, hops, cucumber (in greenhouse and field), pumpkin, pear, prune, roses (in field), violets (in greenhouse and field). In the case of chrysanthemums, the leaves may become spotted if spraying is done too near the time of blossoming. Flour paste was not found satisfactory when used upon greenhouse roses, greenhouse carnations or field sweet peas.

PREPARATION OF PASTE.

'To prepare the flour paste, mix a cheap grade of wheat flour with cold water, making a thin batter, without lumps; or wash the flour through a wire screen with a stream of cold water. Dilute until there is 1 lb. of flour in each gallon of mixture. Cook until a paste is formed, stirring constantly to prevent caking or burning. Add sufficient water to make up for evaporation.

'Flour paste may also be prepared by stirring boiling water into a moderately thin batter until there is 1 lb. of flour in each gallon of mixture, and allowing it to stand until the starch is all broken down.

'If the paste is not sufficiently cooked, the resulting spray will not be effective, and if overcooked the paste will harden when thoroughly cool, and will not mix with water very readily. Usually, however, the paste is used as it is prepared, and overcooking is not a disadvantage.

'When mixed in the spray tank, flour paste has a tendency to settle, and in order to do satisfactory work, agitation is necessary. This is but a slight disadvantage, and is necessary with most materials.

'Flour paste appears to be a very effective spreader for lime-sulphur and nicotine-sulphate sprays. Cheap flour can be purchased for less than half the cost of whale-oil soap. It is always obtainable, and having no odour, it is less offensive to use than the whale oil and fish-oil soaps. When used alone at the rate of 8 gallons (8 lb. flour) to 100 gallons of water it is effective against several leaf-feeding mites and some very delicate aphides. The possibility of its use as a spreader for lime-sulphur sprays for scale insects and fungi and as a "sticker" for arsenicals has not yet been worked out, but from observations during the past four months it is believed that it may have some value along these lines.'

EMPLOYMENT IN CONNEXION WITH CITRUS FRUIT.

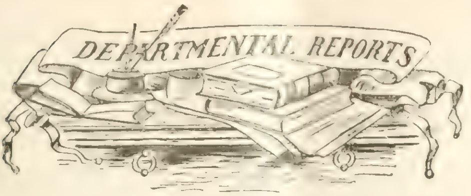
The *Monthly Bulletin* of the California State Commission of Horticulture, for June 1913, contains a brief account of similar trials by J. P. Neills of the United States Department of Agriculture in the use of the lime-sulphur solution with flour paste with check trials in which the lime-sulphur was used without the flour paste added, against the citrus red spider *Tetranychus mytilaspidis*. Check trials were made with the spray without any flour.

The objection to the lime-sulphur solution was that it spotted the fruit, that is to say, the spray mixture collected in drops on the fruit, and when the water evaporated, the solids remained in conspicuous spots, which, in the case of the fruit, had to be washed off before it was packed.

The results of these trials showed that the addition of the flour paste greatly increased the efficiency of the spraying and that there was no spotting of the fruit necessitating washing.

WEST INDIAN EXPERIENCE.

As further evidence of the useful nature of flour paste in spraying, it may be added that a correspondent of the Imperial Department of Agriculture in Barbados has tried flour paste (8-100) against red spider on roses in the garden and reports good results from one application.



JAMAICA: ANNUAL REPORT ON THE DEPARTMENT OF AGRICULTURE FOR THE YEAR ENDED MARCH 31, 1913.

In spite of the occurrence of severe storms and prolonged drought, the report of the Director of Agriculture shows that in Jamaica during the past year progress has been made along several lines of effort. At Hope the conditions of drought were particularly acute, and during the summer months serious losses in live stock would have occurred if it had not been found possible to feed the cattle on sugar-cane. In connexion with the provision of fodder, it has been demonstrated that on the Liguanea Plain it is possible to secure a constant supply of succulent forage in the form of ensilage without irrigation.

After discussing the benefit derived from the Department's assistance in the acclimatization of imported stock, the report goes on to refer to the tropical agricultural college movement, and a statement is put forward that in Jamaica the institution would be an expensive luxury, the cost of which would be difficult to justify in times of retrenchment. The local farm school is regarded as a sound and economic venture and apparently as a satisfactory substitute for the institution just referred to. In the next sentence, the report considers anthrax. It appears that in Jamaica this contagious disease is fairly widely distributed, and during a drought it is very liable to break out on infected land. Tick fever is also very prevalent, but a remedy exists in the form of the Tripan blue treatment.

The subject of plant diseases in Jamaica is dealt with next. It appears that during the past year attention has been given principally to diseases of the banana. It is stated that planters should now feel satisfied that the Panama disease is not a serious menace to the premier industry of Jamaica, and that although it is unfortunately true that this disease has made its appearance, and, in fact had been at work for many years before it was recognized, there is every reason to believe that it can be controlled by fairly simple means.

The report goes on to consider matters pertaining to public health. Owing to the serious risk of plague-rats effecting an entry into the island in consequence of ship communication with Havana, an energetic campaign of rat destruction was carried out. Although success attended the employment of poisonous baits at the beginning of the campaign, the rat community appear now to be fully on their guard against baits of all sorts. It was considered desirable to attempt further destruction by the employment of ferrets. Consequently a consignment of polar cat ferrets was imported from England. Unfortunately the animals proved to be quite useless. Not a rat was bolted from the stored cargo; in fact two of the ferrets were so exhausted from heat prostration that they required first aid treatment before they began to evince any interest in their new surroundings. The mongoose is, of course, vastly superior to the ferrets in activity and power of rat destruction. The Director concludes his varied observations by referring to the problems connected with the milk industry. A table given at the end of the report shows that out of 117 samples of fresh milk tested at the Government Laboratory, thirty-four were adulterated. It is believed to be practically impossible to effectually prevent the theft of milk and its adulteration in Jamaica without the intervention of supernatural forces.

SOUTHERN NIGERIA: ANNUAL REPORT OF THE AGRICULTURAL DEPARTMENT, 1912.

The part of this report dealing with mycological work in Southern Nigeria was dealt with under Fungus Notes in the last issue of the *Agricultural News*. In the following brief abstract matters of general agricultural interest are considered.

On the second page of the report information is presented in regard to a scheme for the establishment of small model farms and nurseries in various districts of the Protectorate. Educational efforts are also being made in regard to the provision of instruction for agricultural pupils at the various economic gardens and experiment stations.

Turning to a consideration of the condition of the staple cultivations, it is remarked that considerable attention has been devoted to the cacao industry. The department has distributed from its various nurseries during the year 39,675 plants and over 12,000 seeds. Efforts are being made to improve the quality of the exported article, and with this end in view, drying houses and fermenting boxes have been established at the Model Farm at Agege and at Moor Plantation. In regard to the quality of cacao, a note from a report furnished by Messrs. Cadbury, England, shows that very considerable progress has been made in Southern Nigeria during the past few years; similar commendation is contained in a report by Messrs. Millers, of Liverpool, who state that the sample of cacao forwarded them, compared favourably with the Gold Coast product. The sample was valued at 55*s.* to 56*s.* per cwt.

The cotton industry continues to make satisfactory progress too; 39,043 cwt. of lint was exported during the year, whilst the crop in the Western Province for 1913 promises to be the heaviest on record.

Rubber under cultivation in the Protectorate chiefly consists of *Hevea brasiliensis* and the *Manihot Glaziovii*, whilst *Funtumia elastica* and several species of Landolphia and Ficus are indigenous, and occur in fairly large quantities in various parts of the Protectorate.

The status of the oil palm industry in Southern Nigeria is shown from the fact that the value of this product exported during the year under review amounted to £4,500,000 sterling. It is suggested that profitable returns might be obtained from the cultivation of the oil palm (*Elaeis guineensis*) on plantation lines, and with a view to gathering data, seed selection and germination experiments have already been inaugurated.

In concluding the remarks on the oil palm industry, attention is given to an interesting observation, namely, the discovery of a valuable variety of oil palm having the perianth persistent around the fruit. The seeds were examined at the Imperial Institute and were found to contain 42 per cent. of palm oil—a yield which is almost as large as that given by the Ab-o-be palm fruit of the Gold Coast or the Aso-e-jub variety of Southern Nigeria (see *Bulletin of the Imperial Institute*, Vol. VII, pp. 370 and 379).

GLEANINGS.

During July, exceedingly dry weather was experienced in St. Kitts, and this has affected crop prospects very unfavourably. Climatic conditions improved during August.

In spite of the adverse weather, the condition of the young cotton crop in Montserrat is regarded as satisfactory. The attacks of cotton stainers appear to have almost entirely abated.

At a recent meeting of the Board of Agriculture of Trinidad and Tobago (July 18, 1913), the Mycologist made a report in regard to the beneficial action derived from spraying coco-nut trees for bud rot

The successful development of the scheme for training agricultural pupils at Dominica is evidenced by the keen competition for the recent vacancies. Three new pupils were selected on probation out of seventeen competitors.

An article in the *Journal of the Jamaica Agricultural Society* (July 1913) deals with the subject of a college of tropical agriculture. The object of the article is to show that Jamaica has as good, if not a better claim as regards site than either Trinidad or Ceylon.

As well as an ordinary collection of exhibits, the Antigua Agricultural Department has recently forwarded to the Toronto Exhibition a collection comprising perishable produce and decorative material as supplementary to the specimens of the staple products of the island sent earlier

According to *Tropical Life* (July 1913) the recently published book on Elementary Tropical Agriculture, by W. H. Johnson, F.L.S., Director of Agriculture, Southern Nigeria, is reliable, concise, and full of much information which will be found useful for purposes of reference.

According to the *Demerara Daily Chronicle Mail Edition* (August 1, 1913) the weather conditions, in Berbice particularly, remain very erratic. Very little rice has been planted, and the outlook is not particularly pleasing. In Demerara, weather conditions have been more favourable.

It is stated in the *Journal d'Agriculture Tropicale* (June 30, 1913) that the largest English firm of soap makers has obtained from the Belgium Government a concession of land in the Congo for producing palm oil, amounting to 750,000 hectares. The oil will be extracted in Africa before being exported to Europe.

During 1912-13, it is stated in the St. Vincent *Government Gazette* (July 16, 1913) that the population of the Colony increased from 43,117 to 44,434. In the St. Lucia *Government Gazette* (July 5, 1913) figures are given to show that during the same period the population there increased from 49,205 to 49,963.

Unusually heavy imports of sugar were made from Java into Japan during 1912, principally in order to make good the reduced supply from Formosa, occasioned by the disastrous typhoon, which laid waste many acres of sugar-cane there. (*Diplomatic and Consular Reports*, No. 5170, Annual Series.)

A leading article in the *Port-of-Spain Gazette* (August 2, 1913) calls attention to the desirability of more stringent regulation in regard to the destruction of forests in Trinidad. There appears to be some foundation for the belief that the recent sequence of droughts has been partly occasioned by deforestation.

According to the *Official Bulletin* of the Republic of the United States of Brazil (July 20, 1913), action is being taken to construct reservoirs at Ceara and elsewhere with a view to combating the drought which so often occurs in that State in spite of the fact that half of the territory is bathed by the Jaguribe River.

According to the *Produce Market Review* (August 9, 1913) there has been in London, a more plentiful supply of oranges from the Cape, West Indies and Italy, which have been sold at lower rates. A further consignment of Transvaal oranges has been disposed of, both the quality and condition being exceptionally good.

The largest living lizard is referred to in *The Field* for July 12, 1913. It has been observed in the Malay Archipelago. In length it measures 7 feet. It has been determined by a zoologist in Java as a new species the name of which is *Varanus comodensis*. It differs from the *Varanus giganteus* in its brown, less pointed snout and shorter tail.

Information is presented in the *Demerara Daily Argosy, Mail Edition* (August 2, 1913) to the effect that the manufacture of citrate of lime is to be resumed in the Colony. It is also stated that the Board of Agriculture in May last decided to ask the Combined Court to vote a sum not exceeding $5,000 for the erection and equipment of the factory.

The amount of wattle bark exported from Natal during 1912, was 7 per cent. greater in quantity, though 2 per cent. less in value than that shipped in 1911. It is said that the present year's prices do not adequately remunerate the growers, and there has been some movement towards reducing the acreage under these tanning-producing trees. (*The Board of Trade Journal*, July 31, 1913.)

A root of Ipomoea (of the sweet potato family) is described in the *Annals of Tropical Medicine and Parasitology* (July 10, 1913). In Rhodesia, it is a native remedy for a disease known as Chilatera, which has erroneously been confounded with sleeping sickness. The root possesses a powerful cathartic and emetic action, but so far the identity of the active drug has not been determined with certainty.

STUDENTS' CORNER.

SEPTEMBER.

Second Period.

Seasonal Notes.

THE MIXING OF FERTILIZERS.

The student who has not had a great deal of practical experience in the application of mineral manures will often feel uncertain in regard to the mixing of the various forms. It is possible, too, that mistakes in this respect are sometimes made by those who might be expected to know better. With a view to assisting the memory, the diagram given below has been reproduced from a recent publication.* The manures joined by a heavy black line should never be mixed together; those connected by a double line must only be mixed immediately before use; and those joined by a thin single line may be safely mixed together at any time.

The student should endeavour to explain the reasons for theee rules in regard to mixing. Thus nitrate of soda must not be mixed with superphosphate because the free sulphuric acid in the latter has a very great affinity for soda and will set free the nitric acid in the form of poisonous fumes (nitric anhydride $N_2 O_5$), whereby the nitrogen is lost. It would really have been safer to have connected these two substances in the diagram by a black line rather than by a double one, but the figure has been reproduced without modification

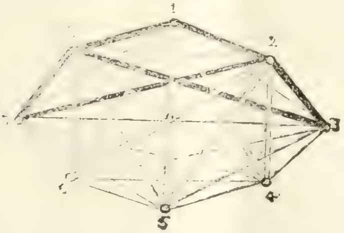


Fig. 24. 1, Superphosphate and Dissolved Guano; 2, Basic Slag; 3, Barn Yard Manure, Guano, and Dried Blood; 4, Kainit; 5, Nitrate of Soda; 6, Potassium Sulphate; 7, Sulphate of Ammonia; 8, Lime, Nitrolim, Ashes, Nitrate of Lime.

Again, slag phosphate contains a strong alkali in the form of caustic lime, and if sulphate of ammonia is mixed with it, the ammonia is displaced by the lime and dissipated into the air. Or, again, if superphosphate and bones or slag are mixed, the soluble phosphate will take up some base and become reverted, or reduced, phosphate.

THE ANSWERING OF QUESTIONS.

The simple illustrations which are given occasionally in the Students' Corner have for their object not only to present information in a concise way but also to call the students' attention to the fact that the diagrams actually do this. The annual examinations conducted by this Department will soon engage special attention and in answering many types of questions, diagrammatic representation is frequently of the greatest assistance, both to the candidate and to the examiner. Drawing should be included where possible in answers to questions relating to practical work. Questions, for instance, on structural botany can only be properly answered with the aid of scale drawings. Similarly, descriptions of experiments should be supplemented by simple illustrations.

With reference to answering questions on practical work in general, the student should endeavour to assume the mental attitude of the teacher, as it were. Little details which give cause for worry at the first attempt at an operation should be remarked upon. They may seem very small and unimportant when the operator is familiar with his task, but to the novice they frequently make all the difference between success and failure.

Questions for Candidates.

Preliminary Questions.

(1) Discuss the following fruits in regard to their value as food: banana, mango, pine-apple, tamarind, and papaw.

Can you explain why most tropical fruits have a thick skin?

(2) Describe an arrangement for destroying the larvae of the small moth borer of the sugar-cane without injury to the natural enemies of this pest.

Intermediate Questions.

(1) Describe the effect of manganese on the growth of pine-apples.

(2) How would you find the area of a triangular piece of land?

Final Questions.

(1) Draw up an account sales form in connexion with the shipment of citrate of lime.

(2) Describe in a practical, but general manner, how you would proceed to plant 100 acres in coco-nuts.

POLLINATION AND CROSS-FERTILIZATION OF RICE.

In view of the necessity of having information concerning the extent of natural crossing for purposes of ensuring a pure seed supply, investigations in regard to the natural fertilization of rice have been carried out in Lower Bengal and the following are the main conclusions arrived at:—

1. That in Lower Bengal under favourable conditions cross-fertilization may take place in rice to an extent which may be provisionally estimated at about 4 per cent.
2. That this cross-fertilization takes place wholly through the agency of the wind and would seem to be effective only between flowers of adjacent plants to a radius of a few feet.
3. That as regards certain characters at least, e.g., grain colour, segregation along Mendelian lines appears to take place.
4. That so long as seed of a variety is kept free from accidental mixture, there is no risk of contamination from cross-fertilization, but that if seed gets mixed, cross-fertilization will undoubtedly take place between adjacent plants in a plot and to an extent sufficient in a few years' time to reduce a variety to a number of splitting types. Hence the imperative necessity of taking every precaution to keep seed of varieties free from accidental mixtures.

The paper from which these connclusions have been taken appeared in the *Memoirs of the Department of Agriculture in India* (June 1913). The author is G. P. Hector, M.A., B. Sc., Economic Botanist, Bengal.

**Queensland Agricultural Journal* for July 1913.

FUNGUS NOTES.

WITCH BROOM DISEASE OF CACAO.

A paper by J. B. Rorer has just been issued by the Board of Agriculture of Trinidad and Tobago, which shows that in all probability the witch broom disease of cacao is caused by a Basidiomycetous fungus and not by *Colletotrichum luxificum*, as was formerly supposed but never definitely proved to be the case.

As is well known, the above disease has occasioned severe loss to the cacao industry of Dutch Guiana, and has occurred in British Guiana and the fact that up to the time of the present investigation the parasitic origin of the malady was a matter of some uncertainty, its study constituted one of the most interesting of tropical pathological problems. Rorer made two visits to Suriname in connexion with the disease; the first visit was for the purpose of deciding whether or not the disease existed in Trinidad; the second visit was taken to carry out a more detailed mycological study of the disease and to make observations on methods of control. The first visit led to the formation of the conclusion that witch broom disease is not present in Trinidad. The second visit has materialized in the form of the present paper.

EARLY INVESTIGATIONS UNSUCCESSFUL.

Ritzema Bos in 1900 was the first to make a microscopic study of witch broom disease known to the Dutch under the name *Krulloten*. This investigator considered the trouble to be due to *Exoascus theobromae* although no figures or description of the fungus were given. In 1901, specimens of the diseased tissue were sent to Kew, and to the Imperial Department of Agriculture at Barbados. The material sent to Kew was examined by Massee who found neither asci nor spores of an Exoascus. In Barbados, Howard, too, was unable to find any evidence of an Exoascus but noticed a species of Fusarium fruiting on the bark which he stated might have been connected with the disease. The malady was first studied in detail by Went. This worker found an intercellular mycelium in the tissues of all parts of the witch broom including stems, petiole, leaf blade, calyx, stamens and pistil. It was lacking only in the immediate growing point. No fructifications were found, and Went concluded that *Exoascus theobromae* was not likely to be connected with the disease. He obtained a pure growth of the mycelium which he noticed in the tissues but was not able to produce fructification nor were the infection experiments successful. He came to the conclusion that infection very probably took place in the bud or in the shoot just beneath the bud as he never found the fungus growing through sound tissue from one to another.

From a study of dried witch brooms sent to the United States Department of Agriculture, Charles has suggested a possibility of a species of Lasiodiplodia being the cause of the trouble.

THE COLLETOTRICHUM OF VAN HALL AND DROST.

In 1905, van Hall and Drost began an extended study of the malady. They isolated a Colletotrichum from the diseased tissue and it appeared to be a new species to which the authors gave the name *C. luxificum*. This fungus has hitherto been regarded as the cause of the malady.

Although Fredholme in his English translation of a paper by these investigators states that inoculations had demonstrated the particular fungus origin of the disease, this rendition is demonstrated by Rorer to be inaccurate. Van Hall and Drost reported no inoculation experiments of their own, and in the paper referred to, reference is evidently made to Went's inoculations which were not successful as has already been mentioned. Van Hall and Drost agreed with Went that the pathological condition known as 'indurated' pods is caused by the same fungus as witch broom disease, and in addition called attention to 'star blooms'—the production of great numbers of crowded blossoms on the cushions—as another symptom of the disease. (See *Agricultural News*, Vol. IX, p. 57.) Among these 'star blooms' vegetative shoots often develop into small witch brooms.

INKAPPING METHOD OF CONTROL.

In the treatment of the disease the authors gave up spraying with Bordeaux mixture on the score of inefficiency and expense and advocated the cutting back or *inkapping* method of control. Briefly stated, this method consists in removing the whole crown of the tree by cutting off the main branches 2 or 3 feet above the point of forking. As soon as the trees begin to put out new shoots they must be carefully watched, and all witch broom must be cut off and burned.

In connexion with *C. luxificum* as a possible cause of the disease, mention may be made of the fact that although witch broom such as described from Suriname has never been seen in Trinidad, a fungus identical in microscopic appearance to *C. luxificum* is commonly found there, but inoculation experiments have shown it to be merely a saprophyte or possibly a weak parasite.

Both Went and van Hall have already pointed out that mycelium is always present in the diseased tissues of stems, leaf, flowers and pod. As soon as the branch begins to die several species of fungi are found fruiting on the surface. Rorer found no evidence however of an Exoascus.

A FUNGUS WITH CLAMP-CONNEXIONS.

During the last visit to Suriname, Rorer made sixty-one cultures from the inner tissues of diseased material. Every one of these cultures was apparently pure, and of the same fungus. After about two weeks, the white surface of the agar slant was covered with a matted surface of mycelium which had a light yellow colour and showed slightly accentuated concentric rings of growth There was no marked aerial development of hyphae. In older cultures, the mycelium became felt-like and slightly darker in colour. The fungus from the diseased pods was identical with that obtained from other tissues. No fructifications were produced on the mycelium The only clue to the identity of the fungus was the fact that the mycelium possessed clamp connexions (which Went evidently missed) and this naturally places it with the Basidiomycetes. Clamp-connexions were observed in all sixty-one cultures. Fresh material sent to Hedges at Washington were found independently by this investigator to contain mycelium possessing clamp connexions both in the tissues and in culture.

It may be mentioned here that owing to the fact that witch broom disease does not occur in Trinidad, inoculation experiments there are out of the question, but these are being conducted by Hedges at Washington on cacao plants under glass, and in due course a paper will be published by Rorer and Hedges following on this the preliminary report on the disease.

To continue Rorer's observations in Suriname, it should be stated that this investigator endeavoured to find out whether there was any likelihood of ants conveying the disease in the form of the mycelium which frequently occurs in small masses on the surface of the bark. No evidence was forthcoming to indicate the possibility of such a means of spread. It may be noted too that another fungus was noticed growing from the cuttings of the tissue. This organism was found to be quite distinct from the Colletotrichum, and its hyphae possessed clamp connexions.

INOCULATIONS SO FAR UNSUCCESSFUL.

Rorer made fifty inoculations with the *Colletotrichum luxificum*, but none were successful, nor were the inoculations made with the Basidiomycetous fungus in any way different from the checks. These latter inoculations were of course made with mycelium, since no spores could be produced, but it is pointed out that from the fact that infection evidently takes place in the bud just as it begins to develop, successful inoculations cannot properly be made until spores of the fungus are discovered.

METHODS OF CONTROL.

As regards remedial measures, Rorer appears to disapprove of the inkapping method, and suggests thorough spraying with Bordeaux mixture in the place of inefficient spraying with copper sulphate. Whilst in Suriname, Rorer recommended the employment of a better type of spray pump.

RUBBER.

VARIETIES OF PARA RUBBER TREES.

The following article, by the Director of Agriculture, appears in the *Agricultural Bulletin of the Federated Malay States* (June 1913):—

The *India Rubber Journal* of March 1, 1912, contained an interesting abstract of part of the report of the Commission appointed by the Brazilian Government to visit the chief plantation rubber-producing countries of the East

A statement contained in the report, which aroused a certain amount of interest in Malaya, was to the effect that all the plantation rubber trees in the Orient belong to an inferior variety of Hevea, known in Brazil as the 'white' variety, while the best rubber in Brazil is produced by trees of the 'black' variety. The only exception, it was stated, were some 200 trees at Pasir Oetjing in Java

In view of the high price our plantation rubber has always fetched, and the statement by Dr. Huber, at New York, that our trees were of the same kind as those producing the best rubber in Brazil, the above statement did not cause great uneasiness. It seemed, however, better to make whatever enquiries were possible and see to what extent the statement was true.

Dr. C. J. J. van Hall, Chief of the Division of Botany in the Department of Agriculture, Java, has very kindly made enquiries regarding the trees at Pasir Oetjing with the following results:—

'All the Hevea trees on this plantation, except the oldest ones planted thirteen years ago, originate from seeds from Valambrosa and other estates in Malaya. No difference can be distinguished between these trees and trees on other estates in Java. The thirteen-year-old trees number about 1,500, they were raised from seed bought from Godefroy-Lebeuf (Paris), who obtained the seed from Brazil.

'Dr. Rutgers went to Pasir Oetjing to investigate these trees. Their appearance is a little different from the common type, their bark being very smooth, or more greyish or whitish than is usual; the bark is thin. The yield from the trees is poor and decidedly below the average. In the leaves there is about the same variation as there always is among Hevea leaves, and nothing particular could be found.

'It thus appears that a number of trees exist at Pasir Oetjing which had a different origin from the common type, and the appearance of which is slightly different. Their yield is poor. If a special name is given to this variety, it should be "white" not "black".'

In addition to what has been said above, the following conclusions arrived at by Sir D. Prain, Director, Royal Botanic Gardens, Kew, will be of interest:—

'It is clear that the scientific botanists who are at work in Brazil have not yet been able to come to a common understanding as to the relative economic value and status of the three sorts of "seringueira" spoken of in your letter as red, black and white varieties. But the evidence, such as it is, points to only the red as being distinguished botanically from typical *H. brasiliensis.* The black and the white, so far as the available evidence goes, are not varieties in a scientific sense; they appear only to be different states of the same type, the particular state which is of most value being that which grows on higher and drier land than the other.

'This last statement of the Commission thus qualified is in complete accordance with what has always been understood with regard to *Hevea brasiliensis*, and we have no reason to doubt the strict accuracy of this statement (see Wickham, *Para Rubber*, pp 5 and 61) that the whole of the Hevea seed originally introduced to the East came from trees which grew under the conditions thus indicated by the Brazilian Commission.'

Use of Sodium Bisulphite in the Preparation of Plantation Para Rubber.—Messrs Beadle, Stephens and Morgan, writing in the *India Rubber World* for August 2, 1913, state that they have tested plantation Para, prepared with sodium bisulphite, and have found it to be of a slightly better quality than rubber, with which the chemical has not been used. It is particularly suitable in the preparation of pale rubber, and the authors take objection to the commonly made statement that the chemical bleaches the rubber. It really only inhibits darkening by arresting fermentative changes. Nor does the reagent make the rubber brittle. as it is often said to do. Rubbers prepared with sodium bisulphite, however, tend to dry more slowly than those not so treated. When small quantities of the chemical are used, the delay occasioned in this respect seldom amounts to longer than two days. The authors believe that the slightly better quality is due to this longer drying period.

Migration of Sulphur in Vulcanized Rubber.—The fact well known to rubber manufacturers, that sulphur is capable of wandering from one layer of rubber to another which has a different sulphur content, led H. Skellon, B.Sc., to investigate the matter, and his results are described in the *India Rubber Journal* (August 9, 1913).

Briefly the experiments consisted in placing together layers of rubber of known sulphur content When the sulphur content was identical, no migration occurred, but when different the migration took place with equal facility, either upwards or downwards. Equilibrium is very quickly arrived at in the two sheets during vulcanization, and then the concentration of the free sulphur in rubber is the same in the two sheets. Vulcanization is regarded as melting of the sulphur, solution of the sulphur in rubber, and slow combination of the sulphur with the rubber.

MARKET REPORTS.

London.—The West India Committee Circular, August 26, 1913; Messrs. E. A. de Pass & Co., August 15, 1913.

Arrowroot—2¾d. to 4¾d.
Balata—Sheet, 2/7; block, 1/11½ per ℔.
Beeswax—No quotations.
Cacao—Trinidad, 70/- to 77/- per cwt.; Grenada, 64/- to 69/-; Jamaica, 63/- to 68/.
Coffee—Jamaica, 57/- to 63/-.
Copra—West Indian, £32 5s. per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 16d. to 18½d.
Fruit—No quotations.
Fustic—No quotations.
Ginger—Very quiet, 37/- to 62/- per cwt.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, no quotations; concentrated, £25 to £26 5s.; otto of limes (hand-pressed), 14/9 to 15/.
Logwood—No quotations.
Mace—1/10 to 2/4.
Nutmegs—4½d. to 4¾d.
Pimento—Quiet, 2⅛d. to 2¼d.
Rubber—Para, fine hard, 3/10; fine soft, 3/3½: Castilloa, 2/4 per ℔.
Rum—Jamaica, 2/4½ to 6/- per gallon.

New York.—Messrs. Gillespie Bros. & Co., August 22, 1913.

Cacao—Caracas, 14¼c. to 15c.; Grenada, 14c. to 14¼c; Trinidad, 14c. to 14¼c; Jamaica, 12c. to 14c.
Coco-nuts—Trinidad and Jamaica, selects, $39·00 to $43·00; culls, $26·00 to $27·00 per M.
Coffee—Jamaica, 10¾c. to 13c. per ℔.
Ginger—7½c. to 10½c. per ℔.
Goat Skins—Jamaica, 50c.; Antigua and Barbados, 45c. to 47c.; St. Thomas and St. Kitts, 43c. to 45c. per ℔.
Grape Fruit—Jamaica, $3·00 to $6·00.
Limes—$2·00 to $5·00
Mace—46c. to 53c. per ℔.
Nutmegs—110's, 13c. to 13½.
Oranges—Jamaica, no quotations.
Pimento—4c. per ℔.
Sugar—Centrifugals, 96°, 3·73c. per ℔.; Muscovados, 89°, 3·23c.; Molasses, 89°, 2·98c. per ℔., all duty paid.

Trinidad,—Messrs Gordon, Grant & Co., September 1, 1913.

Cacao—Venezuelan, $14·75 to $15·00; Trinidad, $14·25 to $14·75.
Coco-nut Oil—$1·30 per Imperial gallon
Coffee—Venezuelan, 16c. per ℔.
Copra—$4·25 per 100 ℔.
Dhal—$4·75 to $4·90
Onions—$1·90c. to $2·00 per 100 ℔.
Peas, Split—$6·20 to $6·25 per bag.
Potatoes—English, $1·75 to $2·20 per 100 ℔.
Rice—Yellow, $5·35 to $5·40; White, $5·20 to $5·60 per bag.
Sugar—American crushed, no quotations.

Barbados,—Messrs. James A. Lynch & Co., Ltd., September 6, 1913; Messrs. T. S. Garraway & Co., August 30, 1913.

Arrowroot—$6·00 to $7·00 per 100 ℔.
Cacao—$15·00 per 100 ℔.
Coco-nuts—$18·00
Hay—$1·50 to $1·60 per 100 ℔.
Manures—Nitrate of soda, $70·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $82·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$1·80 to $3·00 per 100 ℔.
Peas, Split—$5·50 per bag of 210 ℔.; Canada, $4·00 per bag of 120 ℔.
Potatoes—Nova Scotia, $2·50 to $3·00 per 160 ℔.
Rice—Ballam, $5·10 to $5·40 per 190 ℔.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $4·00 per 100 ℔.

British Guiana.—Messrs. Wieting & Richter, August 30, 1913; Messrs. Sandbach, Parker & Co., August 29, 1913.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	8c. per ℔.	——
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per ℔.	——
Cacao—Native	12c. per ℔.	13c. per ℔.
Cassava—	60c.	——
Cassava Starch—	$4·00 to $5·00	——
Coco-nuts—	$16 to $20 per M.	$16 per M.
Coffee—Creole	16c. per ℔.	16c. per ℔.
Jamaica and Rio	16c. per ℔.	16c. per ℔.
Liberian	13½c. to 14c. per ℔.	12c. per ℔.
Dhal—	$4·00 per bag of 168 ℔.	$4·00 per bag of 168 ℔.
Green Dhal	$5·00	——
Eddoes—	$1·32	——
Molasses—Yellow	None	——
Onions—Teneriffe	3½c.	4c.
Madeira	5c.	4½c. to 5c.
Peas—Split	$6·00 $6·25 per bag (210 ℔.)	$7·00 per bag (210 ℔.)
Marseilles	$3·90	——
Plantains—	10c. to 32c.	——
Potatoes—Nova Scotia	$2·75 to $3·00	$2·75
Lisbon	——	$1·20
Potatoes–Sweet, B'bados	$1·44 to $1·68 per bag	——
Rice—Ballam	No quotation	——
Creole	$4·75 to $5·00	$5·00
Tannias—	$1·56	——
Yams—White	$3·00	——
Buck	$1·92	——
Sugar—Dark crystals	$2·30 to $2·35	$2·25 to $2·30
Yellow	$2·55 to $2·60	$2·40 to $2·45
White	$3·75 to $4·00	$4·00
Molasses	$2·00	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

Publications on sale of the Imperial Department of Agriculture
FOR THE WEST INDIES.

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OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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Advertising the West Indies.

ONE Canadian and at least two English journals of great repute and popularity have recently announced their belief that what the West Indies need at present above everything else is advertisement. The subject is an interesting one, and it allows of considerable discussion.

In what ways do the West Indies require advertisement? How is it to be done? One suggestion has been put forward that these Colonies should follow the example set in London by Australia, Canada and the Federated Malay States, and establish an agency in one of the principal thoroughfares where specimens of agricultural and mineral products could be exhibited, and information concerning the Colonies disseminated. It has been said that the West India Committee might take some action in this direction; but we are dubious as to whether any great benefit would accrue from it, at least sufficient benefit to warrant the expenditure which a prominent site and an active staff would demand. It must be remembered, too, that the main object of this sort of agency is, in the main, to attract capital and emigrants. With the exception of British Guiana, British Honduras and perhaps Dominica, there is little opening for the individual capitalist, and certainly none for labour in the West Indies. The general advertisement of these Colonies by means of exhibits has never been neglected however, nor should it be. Representation at the Canadian National Exhibition supplemented by the free distribution of the booklet entitled The West Indies in Canada, revised and published each year by the Imperial Department of Agriculture, continues to answer a useful purpose. The Colonial Exhibition Galleries at South Kensington, if they do nothing more, place on record for general information what these Colonies produce; whilst representation at the Royal Agricultural Show in England is bound to prove instructive to the masses of that country. Most of this form of advertisement, however, is too general and passive to be of any immediate use commercially, though in this connexion due credit must be given to the Canada-West India League for realizing this circumstance as shown by their active display of energy last year at Toronto.

The point we wish to emphasize is that it is not the existence of the West Indies and the kind of produce the colonies export, but rather the conditions of supply, that must be advertised. The manufacturers and the consumers of each class of produce must be reached, and there must be some definite scheme in view.

This consideration leads naturally to the question of markets for West Indian produce. The outlet for the products of these Colonies is, as everyone knows, very divided. The sugar market for Demerara lies between Canada and England, whilst most of the sugar from the Islands goes to Canada only. Cotton is shipped to Liverpool. The market for cacao varies with the place of production. Trinidad supplies are taken chiefly by New York, though a large quantity goes to England and some even to France. Grenada cacao and that from British Honduras is sent mainly to England. New York is essentially the market for West Indian fruit—the Jamaica banana trade and the Dominica fresh lime industry being almost entirely dependent on this centre. At the same time, manufactured lime products and oranges from Dominica find an outlet for consumption in Great Britain. It is evident, therefore, that if a definite policy of advertisement is to be inaugurated, it can only be carried into effect when there is organized contact with these markets. This can be done best by means of trade representatives. These agents would possess the knowledge which is absolutely essential for business advertisement: they would know both the conditions of supply and the conditions of consumption. Only under these circumstances can advertising be done in the right way and at the right time. The agents would work with a definite object. This object might be to create an entirely new demand for any particular form of produce. The way that this were done would be modified according to whether the supply which is to meet it has to be increased at the centres of production or merely deflected from another market. The possible deflection of the Trinidad cacao trade from the United States to Canada may be noted in this connexion. The object in advertising might, of course, be merely to increase a demand already in existence or perhaps merely to maintain a demand. Then there is that form of advertising, the object of which is to improve the standard of the demand for better grades. In this connexion there is undoubtedly scope for advertisement, particularly in regard to Sea Island cotton and in connexion with improved varieties of fruits. One cannot enter here into too much detail, but the circumstance that medical authorities have advertized the fact that bananas constitute highly nutritious food has been a powerful factor in establishing this fruit's popularity.

Turning to another aspect of the subject we may consider the very interesting side of advertisement which may be described as guarding against bad advertisement or as the maintenance of an established reputation. A case in point is afforded by the recent state of the Dominica fresh lime trade with New York. There has existed, of late, some tendency to export inferior grades of fruit—produce which does not come up to the acquired taste of the consumers. This not only means immediate financial loss, but it tends to ruin the market. In the particular case under consideration a New York firm has appointed a representative to safeguard their own interests and those of the growers by inspecting consignments of fruit before they are shipped. Similar action has been taken by a leading firm of chocolate makers in England in regard to the export of cacao from the Gold Coast. This sort of action stimulates the production of high grade materials, and one may be sure that the improved supply which it brings about is wisely advertised in the right quarter.

In conclusion, the view may be expressed that owing to entirely different social, economic and political conditions, the advertisement of the West Indies cannot be compared with that of the autonomous Dominions or even with that of those great tropical possessions in Africa undergoing rapid development. Internally and externally the West Indies present complex trade problems mainly owing to geographical position and lack of general co-ordination. Advertisement should emanate from the markets and reach the actual consumer. It can be done effectively only by representatives who understand and keep up to date with the conditions of supply and demand, and whose first and only interest is the West Indies.

Canada and the West Indies.—'The West Indies are not slow to appreciate the advantages to be reaped under the recently concluded reciprocity arrangement with Canada. For distribution at the Canadian National Exhibition, which was opened on Monday by the Right Hon. R. L. Borden at Toronto, the Imperial Department of Agriculture has prepared a most useful publication, entitled *West Indies in Canada, 1913*. It is fully illustrated with pictures of scenes in the different islands, and also of the principal products. Complete information of the trade of the colonies is given in such a way as to show the Canadian importer and exporter where he can hope to increase his business under the new preferential tariff arrangement.' (The *Standard* [London] for August 28, 1913.)

AGRICULTURAL CO-OPERATION.

ENCOURAGEMENT OF AGRICULTURAL CREDIT SOCIETIES IN THE WEST INDIES.

An Ordinance (No. 9 of 1913) has just been assented to in the Colony of St. Vincent, for the registration, encouragement and assistance of Agricultural Credit Societies under the Raiffeisen system.

MUTUAL CO-OPERATION AND LIABILITY.

It is commonly known that the great underlying principle of these societies is mutual co operation and mutual liability on the part of the members, borrowing and lending being confined to the members themselves, all of whom belonging to one particular village or district being well known to each other and therefore mutually interested in the fulfilment of each others engagements and obligations on which the success of the society entirely depends. A great educational influence is desired to be exercised by the society in its insistence upon good character, upon proper investments, punctuality of repayment and the instruction it gives as to the proper value of money.

GOVERNMENT LOANS.

Turning to the enactments which the Ordinance makes, the following facts appear to be of interest. At the time of application for registration of the Society, the Secretary shall pay to the Registrar a fee of 5*s*. No society shall be registered which consists of less than twelve members. It is enacted that the Governor-in-Council may make loans to registered societies provided that loans in the aggregate do not exceed £500. Provision is made in this connexion that no part of a Government loan is to be applied to any purpose except those incidental to agriculture. If a loan has been already contracted from the Governor-in-Council, the Society may not borrow from private sources without the consent of the Governor-in-Council.

RULES OF MEMBERSHIP AND DUTIES OF THE COMMITTEE.

Coming to the rules for the societies registered under the Ordinance, it may be noted that, as regards borrowing powers, the Society may receive deposits or borrow money at interest from persons other than members. The unlimited liability of all and every member of the Society shall be the guarantee for the repayment of such deposits or of such loans borrowed by the Society.

Every member on joining the Society must be a householder or occupier of land resident in the district. Each member on joining the Society must hold a share. This shall not be less than 4*s*., the amount and time for payment being determined at the annual general meeting of the members of the Society. At these general meetings also will be fixed by resolution the total amount of savings deposits that may be accepted, the total amount of loans that may be contracted, and the maximum of the total advances that any member of the Society may hold at one time during the next year. No member of the Committee shall receive salary or any other remuneration under any conditions whatsoever. The Treasurer, who shall be appointed at a general meeting, must be either a Minister of Religion or a Justice of the Peace or some respectable and responsible person approved by the Governor-in-Council. A special duty of the Committee is to consider the justification of action being taken for the termination of any loan It may be noted here, that no loan can be granted for a period exceeding one year, or to any person who is not a registered member of the Society. The interest to be charged on loans shall in no case exceed 8 per cent. per annum. The interest shall be payable at the time the Committee determine.

A RESERVE FUND.

In regard to financial management, a Reserve Fund must be formed from shares and entrance fees. This fund shall be brought up to the amount of 20 per cent. of the total working capital as shown in the balance sheet, but as a minimum, to the total amount of the share and entrance fee capital. Under no conditions shall the Reserve Fund be divided, and if the Society be dissolved, the money must be devoted to some useful public purpose. A proper system of books is prescribed, and the law requires the customary auditing of the accounts at the end of each year.

CO-OPERATIVE AGRICULTURAL DEMONSTRATION IN THE PHILIPPINE ISLANDS.

In the last issue of this journal attention was called to the growing recognition of the importance of practical demonstration in agriculture.

In the *Philippine Agricultural Review* for June 1913, some interesting accounts are given of efforts directed along this line in that territory. It is pointed out that the main features of the co-operative demonstration work are as follows: (1) the selection of the crop best suited to the land available for the demonstration; (2) drainage; (3) the thorough preparation of the land before the seed is planted; (4) the use of seed of the best variety obtainable; (5) the use of proper methods of planting; (6) intensive tillage during the growing season; (7) demonstration of the value of leguminous plants, barnyard manure and farm refuse; (8) methods of controlling and eradicating plant pests and diseases; (9) value of crop rotation; (10) the reason for diversified farming; (11) the use of better tools and implements; (12) the proper care of live stock; (13) the production on the farm of all food required by both men and animals, (14) farm management.

CO-OPERATION WITH RAILWAY COMPANIES.

In conducting the preliminary arrangements for a co operative demonstration, an effort is made to secure land that is near a public highway, in order that the results of the demonstration may be observed by a large number of people. In one district, during 1911, an arrangement was made to carry on demonstration work in co-operation with the Philippine Railway Company, and to establish demonstration plots plots on land occupied by the railway right-of-way. The actual work was done by farmers themselves, whilst the transportation for the inspectors, and the office and seed room were furnished by the Railway Company. A considerable amount of demonstration work is to be done in future by means of the railway trains themselves, after the system employed in the United States. The car which is now being constructed for this work by the Manila Railroad Company is about 14 metres long, and 3 metres wide, whilst the interior arrangements provide for an aisle running the entire length of the car, the remaining space being used for exhibition and demonstration purposes.

FRUIT.

CHEMICAL COMPOSITION OF TROPICAL AND TEMPERATE FRUITS.

In the last issue but one of this journal a short account was given concerning the chemical composition of common tropical fruits. Since the appearance of that article an interesting treatment of the subject with regard to the composition of temperate fruits has been noticed in the *Journal of the Royal Horticultural Society* (Vol. XXXII), and it was thought that it might prove instructive to compare the figures of analyses with a view to showing which great class is the more nutritious.

In comparing the apple with the mango (carabas variety) we find that the former fruit contains 14·96 per cent. total solids, whereas the mango contains 17·2. In regard to sugar (total), the first-named fruit contains about 7·58 per cent., whereas the mango has 13·24. As regards protein (nitrogenous matter), the apple has about 0·22 per cent., and the mango, 0·22 per cent. also. The total acidity in the apple is 1·04 per cent., whereas in the mango it is only 0·14 per cent. In making these comparisons we have purposely taken one of the less nutritious varieties of mango, and it may be safely said that in regard to chemical composition the balance is on the side of the mango. At the same time the mango contains rather more indigestible matter than the apple, and of course there is the crisp consistency and refreshing characteristics in favour of the apple. This, however, is more a question of taste than nutrition.

Perhaps rather more comparable are the peach and the mango, particularly since in many tropical countries like India these two kinds of fruit compete to some extent on the market. The peach contains about 17·99 per cent. total solids thus closely resembling the poorer varieties of the mango in this particular respect. As regards sugar, the peach possesses something like 1·5 per cent.; the mango, as already noted, has about 13·24 per cent. The peach contains 0·39 per cent. of protein whereas the mango contains 0·22 per cent.

It is interesting to note in conclusion that the English cherry is especially nutritious: it contains about 20 per cent. total solids, nearly 11 per cent. of sugar, over 1 per cent. of protein and 0·6 per cent. of soluble minerals.

Fruits like coco-nuts and other oil-bearing fruits are exceptional in composition on account of the oil they contain. The coco-nut contains about 36 per cent. of oil and the almond 54 per cent. The walnut and filbert of temperate countries contain about 32 and 29 per cent., respectively.

Finally it may be again urged that, in the disposal of tropical fruit, and especially of select varieties, due prominence should be given in regard to the nutritive value of the produce. Although chemical composition is only one factor, and perhaps a minor factor, influencing the consumption of fruit, it must nevertheless have a telling effect to some extent if judiciously and accurately advertised in cases where superiority justifies doing so.

THE PACKING AND TRANSPORTING OF FRUIT IN INDIA.

In a recent issue of the *Agricultural News* a review was published of the report on agricultural progress in India, and reference was made shortly to recent investigations conducted by Albert Howard and Gabrielle Howard at Pusa in regard to the possibilty of effecting improvements in the packing and transport of fruit in India.

In a recent issue of the *Agricultural Journal of India* (July 1913) a paper on the subject appears, and this has been abstracted in the present article.

In general the experience of the investigators indicates that a great field for development is open in regard to the Indian fruit industry without incurring new and expensive means of transport and storage; it would appear that the road to success lies rather in the direction of better methods of production and packing. A few remarks concerning the methods of the natives will make this evident. The crop is often shaken off the branches either into sheets or else on to the ground. A good deal more bruising takes place when the fruit is heaped up before packing. There are no packing sheds. The packages used for the fruit are entirely unadapted for the purpose. Besides being constructionally insecure, there is a general absence of ventilation. The packing material is also unsuitable, articles like grass and leaves being objectionable, in that they give off water instead of absorbing the moisture transpired by the fruit. Frequently the upper layers of fruit press on the lower and a good deal of crushing and bruising takes place in this way.

As already indicated, the fault of the economic loss in the Indian fruit industry is not due to bad railway facilities, which are, in fact, stated to be excellent. There are, for instance, well ventilated fruit vans constructed to run on the mail trains, whilst in other cases, vans provided with shelves are at the service of the industry. There is, however, one objection to the present system of transport, and that is the very frequent occurrence of theft: in this direction the writers emphasize the necessity for the authorities taking decisive action.

The greater portion of the paper deals with the different forms of packing boxes which were tested under practical conditions to find out exactly what arrangements are most economical for ensuring quick and safe delivery. It was found that in the plains, delicate fruit like peaches can be transported without damage when practically ripe, by means of bamboo baskets containing small cells for each peach. Non-returnable packages, made of wood and chip imported from Glasgow have been put on the market at prices within the means of Indian fruit dealers. By means of these packages delicate fruit like peaches, grapes, and tomatoes can be sent to Calcutta from Quetta—a distance of 1,750 miles—without loss or damage. For sending delicate fruit to distant markets on a large scale, the ideal system to adopt is the unit gift package such as a punnet, and to pack these in non-returnable crates. All delicate fruit should be wrapped in paper.

In regard to desirable changes in economic matters concerning the fruit industry in India, reference may be made to the want of arrangements by means of which the market prices of fruit can be circulated and definite contracts with the railway companies made in regard to returnable fruit packages. These facilities exist as it is to some extent, but there is no uniformity. A standardization of the form of contract as regards consignments, and the standardization of fruit packages deserve early and careful consideration.

According to *Diplomatic and Consular Reports* No. 5107—Annual Series, dealing with the trade of the consular district of Jerusalem, the exports of oranges from Jaffa have during the last year shown a slight increase, but it would appear that agricultural progress in general is retarded by a lack of public security. The fact that the inhabitants of the Jewish colony have to pay from £6 10*s.* annually per family in organizing their own means of defence, is significant as regards the state of public order.

LIVE STOCK NOTES.

A FERTILE MULE.

Some very interesting correspondence has recently appeared in *The Field* (August 2 and 9, 1913) concerning the case lately observed in Cyprus, of a female mule with foal at foot. The observations were recorded in the first instance, by G. J. Harvey, M.R.C.V.S., Government Veterinary Surgeon, Nicosia, Cyprus. When called to the case he was informed that the foal was the second one born: last year the animal had given birth to a filly foal which lived two months. The present one was a colt foal two months old by a jack donkey and resembled somewhat a young donkey but was bigger. The mule herself was six years old, 13·2½ hands high, and bay with black points. There were no special marks or stripes and the animal was of a very good type. Enquiry seemed to indicate that she was bred from a she donkey, sire unknown. At the time of writing she was giving milk and the foal suckled in the presence of the Veterinary Surgeon, who was able to certify that both mule and foal were genuine.

THE SCIENTIFIC ASPECT.

In continuation of the letter just dealt with, Professor Ewart, of the University of Edinburgh, communicated to the journal acknowledged above, the following interesting facts regarding the subject under consideration. There appears to be no *a priori* reason why mules should not prove fertile. The male mules with which Professor Ewart has experimented with, were always found sterile because they never succeeded in producing perfect sperms—in some sperms the head-piece seemed normal but the tail was only about one-tenth the usual length. It is believed quite possible that the female mule may discharge perfect eggs from her ovaries, but this has not been definitely ascertained. It is moreover conceivable that the conditions in Cyprus may favour the formation of normal germ cells in at least female mules, and that the donkey-like foal referred to by Mr. Harvey is the offspring of a mule and a jack donkey. It is pointed out, however, by Professor Ewart, that before this could be admitted, positive evidence must be forthcoming to show that the dam of the filly foal is really a mule and not simply a mule-like she donkey.

DWARF CATTLE IN NIGERIA.

Another letter of considerable interest dealing with the subject of a peculiar breed of cattle has recently appeared in *The Field* (August 9, 1913). The breed under consideration is remarkable because the cattle can live and multiply where the much larger and ordinary humped cattle sicken and die, but their reputed immunity to trypanosomiasis (see *Agricultural News*, Vol. XII, p. 315) is apparently only relative. It would seem from collected observations that 'muturu'—as these dwarf cattle are called—succumb to trypanosomes conveyed by *Glossina morsitans*, but are relatively immune to those micro-organisms transmitted by other species of tsetse fly.

A point of much interest is the origin of these animals. In the opinion of Professor Ewart they are probably allied to the small Shetland cattle, and approach the ancient Celtic shorthorn (*Bos longifrons*). How they got to Africa is a puzzle.

GRANTS-IN-AID OF LIVE STOCK IMPROVEMENT IN GREAT BRITAIN.

In *The Times* (August 8, 1913) an account is given of the scheme of the Board of Agriculture of England for assisting in the improvement of live stock in that country. The main object of the scheme is to afford means of demonstrating to groups of farmers, especially the smaller farmers, that it is proper economy and of pecuniary advantage to use only sound and high class sires, and to keep records of the milk yield of their dairy cows as an aid to selection. The grants are made principally for purchasing, or assisting in the purchase of pedigree bulls, heavy horses and boars, and wherever possible the assistance is to be made through the medium of clubs and societies which may either be already in existence or be specially formed for the purpose. Grants, however, may be offered to individual breeders who are willing to place approved bulls at the disposal of their neighbours.

A part of the total grant, which amounts to £37,000 per annum will be expended for the provision of a competent staff of live stock officers who will carry out the scheme under the administration of the Board in the various provinces into which Great Britain has been divided for the execution of the project.

PERCENTAGE OF MILK FAT AND THE QUANTITY OF MILK.

With the issue of the *Journal of the Board of Agriculture* for August 1913, was published a supplement comprising a report on the correlation between the percentage of milk fat and the quantity of milk produced by Ayrshire cows.

The conclusions arrived at are conveniently summarized in the issue of the journal referred to above, and the following points have been abstracted, as being likely to prove of interest to the general reader.

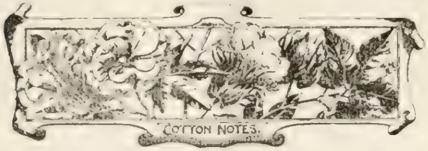
Broadly speaking it was found that the milk of cows which gave the larger average weekly yield of milk showed a definite and appreciable tendency to be poorer in milk fat than the milk of cows which gave lower average weekly yields.

The duration of lactation was found to have no significant influence upon the average percentage of milk fat produced.

With certain allowances, the percentage of milk fat was found to be rather lower in the older than in the younger cows.

In the herd under examination the older cows showed a definite and appreciable tendency to give larger yields of milk than the younger cows. This may be due partly to selection by the breeder, and partly to physiological tendency for older cows to give better yields than younger ones.

The application of these results in practice may lead to great economic improvements. It appears to be possible to select a herd of cows with an average yield of nearly 800 gallons per cow per lactation (as compared with the 1909 average yield of 637 gallons), without reducing the average percentage of milk fat produced in the herd as a whole below 3·58 per cent. as compared with the present average of 3·68 per cent. From this it will be evident that the economic advantage lies in sacrificing richness in order to obtain a more than proportionate increased return in total yield.


COTTON NOTES.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date September 8, with reference to the sales of West Indian Sea Island cotton :—

About 120 bales of West Indian Sea Islands have been sold since our last report, chiefly second quality Nevis, Montserrat, St. Kitts and St. Croix at 15*d.* to 16½*d.*, and a few Barbados at 18*d.* Prices are steady.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending August 23, is as follows:—

We have only to renew our last quotations in the absence of any sales.

We quote,

Extra Fine	28c. to 29c.	= 16*d.* to 16½*d.*	c.i.f., & 5 per cent.
Fully Fine	26c. to 27c.	= 14¾*d.* to 15¼*d.*	„ „ „ „
Fine	25c.	= 14¼*d.*	„ „ „ „
Extra Fine off in preparation	24c. to 26c.	= 13½*d.* to 14½*d.*	„ „ „ „
Fully Fine off in preparation	22c.	= 12½*d.*	„ „ „ „
Fine off in preparation	20c.	= 11½*d.*	„ „ „ „

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre up to August 23, 1913, were 3,146 bales, 7,731 bales, and 4,823 bales, respectively.

Cotton in Nyasaland.—At the one hundred and fifteenth meeting of the British Cotton Growing Association it was mentioned that a report had been received from the Director of Agriculture in Nyasaland stating that the cotton crop now approaching harvest is not going to be such a good one in the Uplands, where it is cultivated principally by European planters, and the crop has never been so late. The conditions on the Shire River, where the industry is carried on largely by native cultivation, are reported to be most promising; the area under cotton is larger than in any previous year, and it is anticipated that there will be a considerable increase in the native crop, but some decrease in the total European crop.

The tobacco industry is making great progress in Nyasaland. It is understood that one of the reasons why tobacco cultivation has made such rapid advances is that the planters are able to realize their produce quickly, and the Association are accordingly arranging to purchase cotton outright from any planters who wish to sell their crops.

Dr. Francis Watts, C.M.G., Imperial Commissioner of Agriculture for the West Indies, was at Manchester on September 5, 1913, and exchanged views with the British Cotton Growing Association. The Commissioner also attended, during September, the meeting of the British Association for the Advancement of Science, held at Birmingham.

SOIL INVESTIGATIONS

RECENT AMERICAN WORK.

The following notes on different aspects of soil investigation have been taken from the *Experiment Station Record,* Vol. XXVIII, No. 9. The experiments on which the results are based were carried out at the Wisconsin Agricultural Experiment Station, U.S.A.

EFFECT OF SULPHUR SUPPLY ON PLANT GROWTH.

Greenhouse experiments showed that 'in the case of rape and radishes, both plants high in sulphur, sulphur fertilization had a marked effect on the yield of dry matter.'

INFLUENCE OF GREEN MANURING UPON GERMINATION OF COTTON.

In pot tests it was found that the decomposition of clover used as a green manure sometimes interferes with the germination of cotton seed, 'but does not have any material effect on the germination of corn, wheat and clover. Two experiments conducted with flax have, however, shown a similar detrimental effect to that produced on cotton. The results so far secured indicate that the decomposition of green manures results in a reduction of the oxygen supply and an increase in the carbon dioxide present in the soil atmosphere. It is thought that this change in gaseous content of the soil prevents the germination of the cotton and flax seed, which contain a high percentage of oil, and so require more oxygen for germination than such seeds as corn, clover, and wheat.'

INCREASED NITROGEN FIXATION FROM APPLICATION OF SUGAR.

The application of sugar markedly increased the fixation of atmospheric nitrogen by the soil organisms which are able to fix nitrogen in the absence of any legume. This increased activity of these bacteria produced an actual increase of nearly 1,000 lb. of nitrogen per acre-foot in three years. Similar results, though not quite so striking, were secured by the application of starch to the soil. It is interesting to note that when kainit and floats were applied together with either sugar or starch, the increase in the nitrogen-fixing power was not so marked.

Interesting results appear in the *Agricultural Bulletin of the Federated Malay States* (July 1913) in regard to the composition of some paddy soils in that country. It has been found that it is in phosphoric acid that the soil of only average fertility is most likely to be deficient. A correlation was found between yield and available phosphate. It would seem to be important to find a fertilizer sufficiently cheap and beneficial to be commercially applicable to paddy soils in Malaya. The Department is arranging experiments to test the relative effect of the various phosphatic fertilizers. It is interesting to note that Malayan paddy soils are invariably clay soils, and hence are all rich in potash.

In Katanga (Congo) the Government some years ago conducted experiments to demonstrate the value of timbered lands for agricultural purposes. They were found to be useless. The reason for the failure of the crops experimented with was the presence in the soil of a large percentage of iron. Much time and money would have been saved if the analyses had been made before attempting to cultivate in the first instance. (*Diplomatic and Consular Reports* No. 5165—Annual Series.)

AGRICULTURAL ENGINEERING.

MECHANICAL PREPARATION OF COIR FIBRE.

Attention is called in the *Queensland Agricultural Journal* for July 1913, to the accumulation and consequent waste of coco-nut husks as a by-product in the copra-making industry. The above publication reproduces an interesting article describing the machinery that it is believed may be economically employed in the ordinary way on plantations to increase the profits of coco-nut cultivation by checking this waste.

Dealing first with the subject of the return of fibre, it is stated that 1,000 nuts yield, on an average, 90 kilos. (about 198 ℔.) of fibre of which 65 kilos. (143 ℔.) are 'brush fibre'. At 45 francs (37*s* 6*d*.) per 100 kilos. (220 ℔.), this represents a rough return of 175 francs (£7 5*s*. 10*d*.), plus the value of the 'mattress fibre'—a total of about 200 francs (£8 6*s* 8*d*.) per hectare (2·471 acres).

FIVE DIFFERENT MACHINES.

Proceeding to a description of the machines which may be employed in the preparation of coir, it is pointed out that the first operation is usually done by natives splitting the nuts with an iron spike, but that the work can be more conveniently carried out by a machine which has three serrated knives which seize the nuts, cut each up rapidly, when it falls to the ground in three separate parts. A day's work is said to amount to 14,000 nuts, which represents the labour of fourteen men, as it requires a skilled workman to open 1,000 nuts a day by hand.

The next operation is called 'retting', a process which cannot be done by machinery since it is a slow process lasting for many months. The object of this process is to soften the fibres and produce a favourable yellow appearance. After the material has been 'retted', extraction may be done, but it is generally desirable before proceeding with this operation to subject the husks to a crushing process. This may be effected by a machine composed of two deeply fluted rollers, between which the shells are passed, whence they emerge flattened out, the fibres being now partially free from the glutinous substance which clogs them.

The fourth operation is extraction. In using the extractor machine the workman passes the *débris* of the shell to the small rollers in front of the machine, which drag them in slowly, after which they come in contact with the teeth of the main roller which tear out the short fibres and perform a kind of combing on the long ones

The fifth process is done by the finishing machine. This enables the fibres to be separated from the *débris*, and the short fibres remain in the hands of the workman, who passes them into the separator, a sort of inclined roller, made of a frame covered with metallic cloth over which the *débris* and dust pass, whilst the long fibre comes out at the end.

A special extractor machine has been invented for dealing with unripe fruit.

POWER REQUIRED.

To drive the machines described above, simultaneously, it is stated that a 20 h.p. engine would be required for the treatment of 2,500 nuts per day, unless rope be made (unlikely on an ordinary plantation) when a 28 h.p. engine would be needed. For 5,000 nuts from 28 to 44 h.p. must be obtained.

A Reversible Steel Barrel.—It may be remembered that reference was made to this invention in a recent issue of the *Agricultural News* (Vol. XII, No. 288). The notice has aroused considerable interest. Not only locally from Dominica, but also from Ceylon have enquiries been made at this Office for further information on the subject. It may be of interest and of use to the readers of this journal to be informed that the makers of the patent barrel are:—The United Barrel Syndicate, 29 Mincing Lane, London, E.C.

In a communication from the Technical Editor of the *International Sugar Journal* it appears that the above firm is believed to be in a preliminary stage, and it is not definitely known whether they are yet able to fulfil any orders passed to them.

Patent Implement for Singling Plants.—The interesting implement illustrated in the accompanying figure is made in one piece which combines two cutting utensils requisite for singling and hoeing at the same time. One end of the tool consists of a curved blade with cutting edges on both sides (b), and in front (a). At the other end there is a narow knife bent obliquely at an acute angle. Between the two is a wooden handle (f).

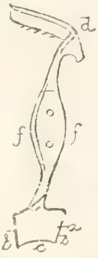


FIG. 25.

The *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (July 1913) from which this information has been taken describes the way in which the implement is used. Unfortunately this description is not given in sufficient detail to make it perfectly clear. Briefly it would seem that the curved blade (a) is driven into the ground near the plant which is to be left behind. The edges are then pressed and turned right and left in the ground about it. This is to destroy unnecessary plants in close proximity. The cutting edge (c) destroys weeds reaching low down. The bent knife (d) at the other end of the implement is employed for singling other plants, and hoeing the soil at a greater distance from the required plant dealt with first.

A Cacao Picker.—The *Proceedings of the Agricultural Society of Trinidad and Tobago* for July 1913 contains an interesting account of the advantages which are said to accompany the employment of a mechanical cacao picker. It is said that with very little practice an ordinary workman can pick more fruit in a given time with this new tool than with the old, and without injury to the trees. The cutting surface of the picker is very small. The fruit stock is introduced into a fork-like opening through which it is guided down to the cutting surface by which the stalk is severed without injury to the tree or to the unripe fruit. It is put forward as a special advantage that in using this implement it is possible always to cut the stalk at a joint—the proper place. With an ordinary cutting tool the fruit stalk is cut in almost any place.

The cutter in question can also be used for the removal of dead twigs and for other pruning purposes. The tool, which is known as the 'Star' cacao picker, is manufactured and placed on the market by the Wilkie Trading Co., Ltd., Paris.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

VOL. XII. SATURDAY, SEPTEMBER 27, 1913. No. 298.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with considerations in regard to advertising the West Indies. The importance of trade representatives on the different markets is discussed, together with the value of representation at exhibitions.

On page 307, information is given in regard to matters relating to agricultural co-operation locally, as well as in the Philippine Islands.

Under Live Stock Notes, on page 309, a remarkable case of a fertile mule is described.

The subject of a reversible steel barrel, which has attracted so much attention, has been followed up by this Department, and a note thereon will be found on page 311.

On page 312, a few suggestions are put forward in connexion with the proposed extension of banana cultivation in British Guiana.

The rules of the Grenada Branch Agricultural Societies are summarized on page 313.

Insect Notes, on page 314, contain much miscellaneous matter of immediate interest.

Under the heading, Students' Corner, reference is made to the forthcoming examinations in practical agriculture, conducted by the Imperial Department of Agriculture.

Banana Cultivation in British Guiana.

Under the heading of Minor Agricultural Industries, the Demerara *Daily Chronicle* (Mail Edition, August 26, 1913)—which has for some time agitated for an extension of the area under banana cultivation in British Guiana—warmly protests against a statement made by the United Fruit Company to the effect that the supply of bananas is exceeding the demand. A statement to the opposite effect is quoted from a recent issue of the *Agricultural News.* And our contemporary is perfectly right. So far as reliable information is available, there is no indication of a future glut. For instance the recent special supplement to the *Chamber of Commerce Journal* (July 1913) says: 'The increasing consumption of bananas in a number of countries naturally raises the question of an adequate supply to meet the coming demand.'

The following statistics seem rather significant, in regard to a British Guiana supply. Out of 6,978,867 bunches of bananas, valued at £1,964,200, imported into the United Kingdom in 1912, 2,644,311 bunches, valued at £665,014, came from Colombia, and 2,588,109 bunches, valued at £648,090, from Costa Rica. Only 67,276 bunches, valued at £10,586, went to the United Kingdom from the West Indies.

Why should not British Guiana participate in the trade of Colombia and Costa Rica?

If the existing temerity is chiefly occasioned by the present freight arrangements, proper but determined representation should be made at headquarters immediately.

Views on the Establishment of Agricultural Colleges in the Tropics.

The opinion has already been expressed in these columns, that the initiative action as regards the establishment of agricultural colleges in the Tropics should emanate from the British Universities rather than from the general public or from official quarters. Public grants and Government subsidies might reasonably be looked for in the Tropics as they are in England, but the initiation and the administrative control should be in the hands of well-established universities. In the words of Professor Farmer, great educational institutions cannot be created by a stroke of the administrative pen. They must grow and justify their existence. The fostering action of a mother institution should tend most of all to ensure this natural development.

In an article in *Tropical Life* (August 1913) great importance is attached to the circumstance that British financial interests are greater in the East than in the West; this, it is believed, renders the raising of funds in the East more practicable than in the West. A further view expressed is that, as regards Government support, the proposed West Indian agricultural college should be as deserving of as much liberality as an institution like the British Cotton Growing Association.

These views have much to support them, but it is very necessary to distinguish between the establishment and maintenance of different concerns. The establishment of a college is not like floating a limited liability company. Dividends are not declared. The requisite funds must be in the nature of an endowment and given irrespective of immediate financial considerations. Afterwards, Government assistance may be looked for, and possibly, when the beneficial influences of the institution are felt, seen and then appreciated, the more materialistic capitalists interested in tropical production may come forward to assist in increasing numbers.

It may be added for the information of those immediately interested in the establishment of an agricultural college in the Tropics, that the latest issue of the *Tropical Agriculturist*, the organ of the Ceylon Agricultural Society, shows that definite steps are being taken by the authorities there for bringing about a materialization of what has so long been a mere project.

Practical Work in Secondary Schools.

Everybody is interested in the education of children. A particularly important aspect of the subject is dealt with in the Report of the Consultative Committee on Practical Work in Secondary Schools, recently issued by the English Board of Education. To readers of the *Agricultural News*, that part of the Report which concerns practical work in rural schools will be more definitely appreciated. The following embraces some of the Committee's recommendations.

The environment of a rural school should be utilized to the full for educational purposes. This does not mean that the secondary school should be turned into a farm school, but it means that a land basis should be given to the general work of the school; that a rural atmosphere should be created in it. The teaching of English, Science, Mathematics, Handwork and Geography should, as far as possible, take the surroundings of the school as a basis or setting.

The question of providing a suitable curriculum cannot be solved by the introduction of a definitely agricultural side so far as concerns the earlier school years. All the pupils, however, should receive agricultural instruction before they leave school; there should be no distinction between 'agricultural boys' and those not denominated by that term. The science teaching should be made practical. This does not mean that technical instruction in agriculture should be given. It is necessary that the teacher should be interested in rural work and great importance is attached to the existence of a proper correlation between the study of chemistry and botany and that of gardening.

The importance of literary studies is not overlooked. The tendency of pupils to be ever ready to do anything with their hands and to disregard reading and solid study must be carefully borne in mind. A large number of farmers engaged in agriculture to-day rarely read even up-to-date information about their own special work; their business has been learnt by hard practice and they do not like nor understand how to apply book information. This attitude of mind it must be the vital aim of the rural school to eradicate.

Branch Agricultural Societies.

The Superintendent of Agriculture, Grenada, has just sent a copy of the Bye-laws of the Grenada Agricultural and Commercial Society relating to the formation and constitution of Branch Societies. Any movements in the direction of extending operations and influence in this way are of interest and importance, particularly in regard to the larger colonies having outlying districts.

In Grenada, the President and Vice-Presidents of the Agricultural Society and the senior officers of the Agricultural Department are at liberty to attend any meetings of any Branch Society, and ordinary members are members of the Branch situated in the district where they live. Each Branch Society selects its own Chairman, Secretary and Treasurer. The annual subscription is the same as for the head society, but a Branch may be at liberty to accept a less amount than the minimum (5s.). Members paying reduced subscriptions have no voice in the management of the Agricultural Society. Within one month after the Annual General Meeting, the local Secretaries must send the Secretary at headquarters an estimate of expenses for the coming year. Subscriptions are collected by the local society and paid into the general fund. All members of Branch Societies of good standing are entitled to receive the publications of the Society free. Membership is open to anyone who is willing to conform to the above rules.

Growing Tobacco for Insecticide Purposes.

During the last few years considerable work has been done at the Wye Agricultural College, Kent, in regard to tobacco growing. It has been found that under the temperate conditions of England, tobacco can be grown which, although it lacks those characteristics essential for cigar production, possesses the important distinction of having a high nicotine content. This circumstance naturally suggests the idea of growing tobacco for insecticide purposes, and there does not appear to be any practical objection to the application of the idea under tropical conditions. The nicotine content could no doubt be greatly increased by chemical selection.

Up to the present the employment of nicotine as an insecticide has been limited, owing to the circumstance that this alkaloid is generally used in the spray mixtures in a pure form. Its extraction involves technique, which at present is a trade secret in the hands of a few manufacturers who keep the price up in consequence.

Mr. D. R. Edwardes-Ker, of the Chemical Department at Wye, has shown that nicotine can be quite satisfactorily extracted from tobacco by means of water —preferably warm water (not above 140° F.), or better still, by soft soap and water.

It was actually found that 97 per cent. of the nicotine could be extracted by water at 140° F. after three treatments of half an hour each during three successive days.

The results referred to above are summarized more fully in the *Experiment Station Record* for August 1913.

INSECT NOTES.

DESTRUCTION OF MOLE CRICKETS IN PORTO RICO BY THE HERON OR GAULDING.

In the *Experiment Station Record* for June 1913, there appears the following note entitled Useful Birds of Porto Rico:—

During the economic investigations of birds in Porto Rico by the Biological Survey of this Department, several species of herons were found to be valuable to agriculture in destroying large numbers of 'La Changa' or mole cricket. This is especially true in the case of the green heron, and to a less extent of the little blue heron and snowy heron. With a view to protecting the heron, it has been recommended that certain areas of mangrove swamps under insular control, which the herons frequent for resting places and for the purpose of breeding, be designated as bird refuges.

The green heron mentioned as being particularly useful in this connexion is probably the common gaulding (*Ardea virescens*), which is resident in Barbados and perhaps in other islands of the Lesser Antilles, whilst the grey gaulding (*Ardea herodias*) which visits most of these islands, even if it may not be a resident, is probably the little blue heron. The white gaulding (*Ardea egretta*) may be the same as the snowy heron mentioned in the note above.

THE COTTON BOLL WEEVIL IN THE UNITED STATES DURING 1912.

At the West Indian Agricultural Conference at Trinidad in January 1912, a paper was presented by the Entomologist to this Department, reviewing briefly the occurrence and spread of the boll weevil in the United States up to the end of 1910, according to the published accounts of the United States Department of Agriculture. (See *West Indian Bulletin*, Vol. XIII, p. 29.)

Recently a further account of the spread of this insect has been issued in Circular No. 167 of the Bureau of Entomology, entitled, The Movement of the Cotton Boll Weevil in 1912, by W. D. Hunter and W. D. Pierce.

In this paper it is shown that although the boll weevil lost ground to the extent of 15,240 square miles, principally in the northern portion of the infested territory, yet it made a total gain of 22,720 square miles chiefly to the eastward, thus showing a net gain in infested territory of 7,300 square miles.

The set-back which the insect received in the northern portion of its range is stated to be due to the unusually severe climatic conditions which prevailed in the section during the winter of 1911-12. It is worthy of note that since 1906, there has been but little change in the boundary line of the infested territory on the extreme west, in southern Texas, and that to the east, especially in the coastal region, there has been each year a regular and very considerable extension.

The Circular includes a very interesting map on which the boundary line for each year since 1902 is shown, and a table is presented giving the gain and loss for 1912 in each of the States within the infested area. The following figures showing the totals and the net gain for 1912 are interesting:—

Area infested in 1911, sq. miles.	Gain in 1912, sq. miles.	Loss in 1912, sq. miles.	Area infested in 1912, sq. miles.
271,500	22,720	15,420	278,800

Net gain in 1912, 7,300

A LUCERNE AND LAWN PEST.

Under the heading Insect Notes in the *South African Agricultural Journal* for July 1913, there is given a brief account of a caterpillar (*Caradrina exigua*) which, although possessing a wide range of food plants, has been particularly injurious to newly-planted lucerne and to lawns in the Transvaal.

This insect is a dull-coloured, hairless caterpillar, which when full-grown measures about 1¼ inches in length. It is a voracious feeder reaching its full growth in a short time. There are several broods in a season.

Many fields of lucerne were eaten bare and no success was reported from trials of spraying with Paris green and arsenate of lead.

Lawns in Pretoria and other towns were badly attacked. The spraying of these with the insecticides mentioned above was found to be effective if the spraying was done before the injury had gone too far, that is, before the foliage of the grass was all eaten off. When the injury had proceeded so far that only the bare stems of the grasses were left, resort was had to the use of poisoned baits.

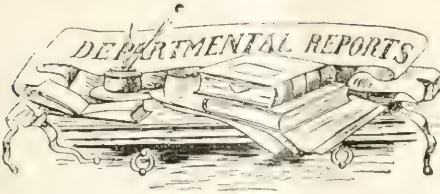
The poisoned bait which, in the trials conducted by the Agricultural Department proved most effective, consisted of bran (pollard) 20 lb., sugar 4 lb., Paris green 1 lb. The sugar was dissolved in a gallon of water. This was used to moisten the bran, after which the poison was carefully stirred in until it was uniformly distributed throughout the whole mixture. When prepared in this manner the poisoned bait was merely damp and friable, not adhering in masses. It was applied in the late afternoon at the rate of 100 lb. per acre, being scattered broadcast. It proved to be very effectual, a large proportion of the caterpillars succumbing to the effects of the poison by the following morning.

A similar bait in which the poison used was arsenate of lead instead of Paris green, was also efficient, but its action was slower, and on this account was not considered so satisfactory for use on badly infested lawns.

ANOTHER COCKROACH POISON.

Residents in the Ttropics are, at one time or another, interested in controlling cockroaches, which if left to develop unchecked, often become a great nuisance. The mixtures of chocolate and boric acid, molasses and boric acid, and flour and plaster of Paris are all generally known. Another mixture which has recently been tried in Barbados with apparently very good results contains naphthalene and boric acid in equal parts, the naphthalene being pounded or crushed in a mortar to a fine powder before being mixed with the boric acid.

This mixture has been sprinkled plentifully in the haunts and hiding places of cockroaches at intervals, say, of about two weeks, and after two or three applications the insects almost entirely disappeared. Readers of the *Agricultural News* may be glad to try this mixture in order to compare the results with those yielded by the use of the better-known cockroach poisons.



NYASALAND PROTECTORATE: ANNUAL REPORT ON THE DEPARTMENT OF AGRICULTURE FOR THE YEAR ENDED MARCH 31, 1913.

The climatic conditions for the year under review were marked by a scarcity of rain. There was a resulting dearth of food for native employees, and this necessitated the strictest economy in labour which to some extent influenced adversely agricultural progress for the time being.

COTTON.

The cotton crop for the year was a successful one. In regard to the markets for cotton, some delay was occasioned by several circumstances, yet the prices paid for first quality cotton varied from 8*d.* to 9¼*d.* per lb. or about 1*d.* per lb. in advance of last year. In the marketing of the cotton more attention is now being directed to the important question of baling, and it is hoped in a few years that the 400 lb. bale, which is the official bale of the British Cotton Growing Association, will become the standard of the Protectorate. Seed selection in cotton cultivation has received careful attention.

The success which has so far been obtained in regard to the native industry has been due largely to the establishment of Government cotton markets where the lint is inspected and weighed by the Government before being offered to the general public for sale. The willingness on the part of the British Cotton Growing Association to purchase lint from natives all over the Protectorate has also been of very great assistance.

TOBACCO.

The acreage under tobacco for the year under review was 7,411 as compared with 4,507 in the previous year. The tobacco industry in Nyasaland is stated to be making wonderful progress, and considering in 1902 the total export amounted to only 60 lb. as compared with 2,262,545 lb. in the year under review, it may be presumed that in a few years when more capital has been attracted to Nyasaland, the industry will become a very important factor in the tobacco markets of Great Britain. It is instructive to note that of late complaints have been received from manufacturers in regard to the packing and size of bales. Standardized bales 2 feet 6 inches × 2 feet 6 inches × 2 feet, with double canvas packing are strongly advocated. In connexion with the industry an appeal is made for greater assistance on the part of the Government which might be shown, for instance, by the appointment of a tobacco expert on the staff of the Department of Agriculture.

TEA AND COFFEE.

The tea crop is one of the most important minor cultivations of the Protectorate. The export of the commodity for the year under review amounted to 67,726 lb. as compared with 43,876 lb. in the previous year. Nyasaland tea is gaining rapidly in favour with the local population and is largely consumed by most people in Nyasaland. The local price is 1*s.* to 1*s.* 6*d.* per lb.

The partial failure of the rains again proves coffee to be the most fickle crop of Nyasaland. There was a marked decrease during the year, the value of the exports falling from £16,381 to £4,868. This meant a reduction in area under cultivation of 1,135 acres. It is to be regretted that coffee is an unstaple crop in Nyasaland since the quality leaves nothing to be desired.

CHILLIES AND CAPSICUMS.

Nyasaland chillies remain the standard on the home market, but on account of over-production last year the market was totally swamped and there was a big drop in prices accompanied by a consequent reduction in acreage from 789 to 213 acres. This should tend to improve prices in the coming year.

RUBBER AND FIBRES.

Most of the rubber grown in the Protectorate is Ceara. The uncultivated source is principally *Landolphia parvifolia*, the rubber of which is successfully extracted from the underground parts by combined mechanical and chemical processes.

Turning to the subject of fibres, it is stated that both sisal and Mauritius fibre suffer from cold in the higher elevations, but give profitable results when cultivated below 2,500 feet. The success of the British Central Africa Company in connexion with this cultivation is believed to be in great measure due to their enterprise in importing a 'New Corona' fibre machine—a machine which can extract 30 cwt. for a ten hours day: with a higher fibre percentage, indeed 2 tons might reasonably be expected.

PLANT DISEASES AND PESTS.

The most prevalent disease during the year has been *Cercospora nicotianae*, which has been very common on many tobacco estates. A species of Vermicularia was observed on the safflower crop, and specimens of Ceara rubber were found attacked by one of the Polyporaceae the name of which was not determined. Tea has been found affected with the 'shot hole' disease. The fungus responsible for this condition in India, *Pseudopeiziza Guepini*, has not been observed on material collected in Nyasaland.

The year has been characterized by a severe general outbreak of leaf-eating caterpillars. The weather has been favourable for this increase, and the view is expressed that the long dry season may have destroyed the natural enemies of various species. The chief pests of cotton in Nyasaland are the boll worms, which include three species—the red boll-worm (*Diparopsis castanea*), the Egyptian boll-worm (*Earias insulana*), the American boll-worm (*Chloridia armigera*). Cotton aphis, leaf-hoppers, stem weevils and termites have also been responsible for some damage to cotton. Tobacco has been far more free from disease than cotton. The chief pests of tobacco are the leaf-eating caterpillar (*Prodenia litura*), the tobacco stem borer (*Phthorinae heliopa*) and cut worms. These latter are the worst enemies of tobacco that has been planted out.

VETERINARY INVESTIGATIONS.

After referring to the resolutions passed by the Veterinary Conference held in April 1913, the Veterinary Officer proceeds to discuss the circumstances surrounding outbreaks of trypanosomiasis. It is believed that the disease was contracted in two of the outbreaks from stray tsetse flies following game or natives from one or other of the small tributaries of the Shire River, and eventually finding their way on to normally healthy grounds of the herds in question. A certain amount of loss is caused in cattle from piroplasmosis. This being a tick-borne disease, great emphasis is laid upon the necessity for systematic dipping.

GLEANINGS.

In spite of the dry weather, the cane crop in the northern district of St. Kitts is sound and healthy, there being no signs of disease, as there was last season.

During August, the Agricultural Superintendent, St. Lucia, directed the internal structural work in the new lime factory. The mill was received and mounted.

Dominica rainfall was normal during August in Roseau, but considerable damage was reported from the windward side of the island owing to excessive rains.

Bendal's and Gunthorpe's sugar factories in Antigua have closed down for the season. The latter made 7,350 tons of sugar, not including second sugar, as against 6,200 tons last year.

An Ordinance is published in the Uganda *Official Gazette* which provides for the protection of agricultural produce. Loitering or lurking on plantations is a punishable offence.

In Montserrat, the chief agricultural problem at present is the ill health of the lime trees. It is stated that the dry weather is making the position less and less hopeful. A very poor crop is being obtained.

According to the *Port-of-Spain Gazette* (September 7, 1913) considerable disappointment has been occasioned in one of the school gardens in that island through the occurrence of praedial larceny.

The condition of the crop on the small holdings in Grenada gave cause for much anxiety during June and July. Since then, however, the appearance of all the crops has greatly improved. This is most noticeable as regards the corn and cane crops.

A considerable amount of travelling was done during August by the Agricultural Superintendent and the Assistant Agricultural Superintendent, St. Vincent. A large number of estates and small holdings was visited. A trip was made to the Southern Grenadines.

The taxes on rubber exported from the Congo State have been reduced. The tax on plantation rubber is nil; the highest duty is put upon tree or vine rubber to the extent of 60 francs per 100 kilos. (*The Board of Trade Journal*, July 17, 1913.)

A catalogue has been received from Messrs. Merryweather and Sons, Limited, London, which describes a fire hose nozzle that performs six entirely separate functions. It is said to be of the greatest assistance in attacking and preventing the spread of conflagrations.

In the issue of *Nature* for August 14, 1913, a plea is put forward for a continuation of the seismological observations and researches of the late Professor Milne. The most fitting monument to his memory would be the continuation and development of his great work.

A note appears in *The Board of Trade Journal* (August 7, 1913) to the effect than an agreement has come into force between the Java cinchona bark planters and quinine manufacturers, and that an absolute ring has been formed in this commodity.

According to the Antigua *Sun*, a prospectus will be issued shortly of Bendal's (Antigua) Sugar Factory Limited, a company formed for the purpose of acquiriug the well-known business of that name for so long carried on by the late Mr. A. M. Lees' firm. The capital of the company is £22,500.

Considerable dissatisfaction has been shown in America in regard to the inferior quality and bad condition of cigars imported into that country from the Philippine Islands. Efforts are being made at Manila to secure more uniformity and an improvement of quality. (*Diplomatic and Consular Reports* No. 5089—Annual Series.)

The best way to destroy rats in cane fields—according to the *Australian Sugar Journal*—is to expose bread with dripping on it, or a split banana upon which a few drops of essence of aniseed has been placed, together with the poison, strychnine. In using baits it is always necessary to expose at first a little without any poison on it.

The *Gardeners' Chronicle* gives considerable attention in the issue for August 23, 1913, to the newly established National Botanic Garden in the Union of South Africa. For upwards of fifty years the project of a garden has been under consideration, and it must be gratifying to those who have worked so long and devotedly for this object, that it has at last attained fulfilment. The Garden will occupy an estate on Table Mountain.

The metal barium occurs in tobacco and in other plants. According to the *Journal of the Chemical Society* (July 1913) it has been shown that the poisonous effect of loco-weed (*Astragalus* sp.) on cattle, is due to the presence of barium. Barium has been found in tobacco in amounts varying from 0·009 per cent. to 0·074 per cent. (calculated as barium sulphate).

The St. Kitts *Daily Express* continues to publish from time to time, notes agitating against the conditions of the milk supply in that island. It will be remembered that an editorial on this subject recently appeared in the *Agricultural News*. This leading article has been reproduced in several of the island newspapers and it is hoped that it will be found possible for the authorities to give sympathetic consideration to the suggestions which were put forward in it.

STUDENTS' CORNER.

OCTOBER.

First Period.

Seasonal Notes.

FORTHCOMING EXAMINATIONS IN PRACTICAL AGRICULTURE.

This year's examinations in practical agriculture will be held on the following dates:—

Preliminary Examinations, October 27, 1913; Intermediate and Final Examinations, November 10, 1913.

The number of entries are as follows:—

Grenada: Preliminary, two candidates. Dominica: Intermediate, two candidates; Final, one candidate. Antigua: Preliminary, three candidates; Intermediate, one candidate; Final, one candidate. St. Kitts: Final, one candidate.

It may be opportune at the present time to offer a few advisory remarks of a general nature in regard to these examinations. In the report on the last year's Preliminary Examination (see *Agricultural News* Vol. XI, p. 381) attention was called to a general weakness in regard to the provision of simple illustrations to certain types of questions. A general weakness was also shown in regard to animal physiology. On the whole, there was evidence which indicated that candidates might have referred, during the course of their studies, more frequently and carefully to the syllabus of subjects, not with the intention of limiting their knowledge but with the object of making it as complete as possible, as far as is required for dealing with the questions that might be asked.

In regard to the Intermediate and Final Examinations, the importance was pointed out, of candidates bringing their practical experience to bear upon their answers to as great an extent as possible. Past examinations have shown that many candidates fail to do themselves justice through inability to express themselves in writing. It is very necessary to think over the question and frame an answer to it before commencing to write. Frequently the candidate gets involved in a long sentence. Sentences should be kept short, and observations ought to be tabulated as far as possible. Written description can be saved considerably by giving clear labelled drawings made to scale.

Last year, in the special crop subjects, general weakness was evinced in regard to the manuring of the sugar-cane, sugar-cane nurseries, the classification of canes, the manner of production of rotoons; also in connexion with diseases and the manuring of cacao, the general seasonal work on a cacao estate and varieties of cacao. Attention, in regard to limes, was required respecting insect pests, lime nurseries, the packing and marketing of lime products and the testing of lime juice. As regards cotton, improvement was needed in regard to such matters as the examination of seed-cotton, the manuring of cotton, and the action of the Sea Island cotton gin. (See *Agricultural News*, Vol. XII, p. 13; also Vol. XI, p. 401.)

In conclusion, all candidates may be advised—but particularly the Intermediates and Finals—to run through the present volume of the *Agricultural News*, carefully noting recent discoveries, new and useful methods and general agricultural progress in the West Indies. This will constitute a valuable revision and bring the candidates' theoretical knowledge up-to-date.

RECENT BOOKS.

Vegetable Alkaloids.—A book has just been published by Messrs. Churchill, London, dealing with the above subject. The author is Dr. T. A. Henry, well known for his researches into the composition of the alkaloids. The book is reviewed in *Nature* for August 21, 1913. The subtle nature of the chemistry of the alkaloids is remarked upon, and it is pointed out that not only has Dr. Henry achieved important results in regard to the chemical structure of alkaloids, but also in connexion with the correlation between their chemical constitution and action on the animal system. A great deal, however, remains to be done in this latter direction. Another question on which the book provides some information is that of the function of alkaloids in plants. It has variously been believed that they are end products of metabolism, or protective substances, or possibly nutrient materials. On this question Dr. Henry touches though but lightly, in the introduction to the work under notice.

The one criticism which the book invites, is that it is too much like a collection of extracts from the *Journal of the Chemical Society*. But it is said to be a good collection.

A copy has just been received at this Office, of the booklet entitled Coco-nut Cultivation in the West Indies, reproduced by the Tropical Exploitation Syndicate Limited, London, by permission of the Imperial Commissioner of Agriculture for the West Indies, from the pamphlet having the same title, published by this Department two years ago. It is unfortunate that in the preface, the name of the late Mycologist to this Department who wrote the greater portion of the subject-matter, has been wrongly reproduced as F. W. Smith. It should have been F. W. South.

Manihot Rubber.—A new book on Manihot rubber by Professor A. Zimmermann is reviewed in *Nature* (August 7, 1913). In the East, these forms of rubber-yielding trees have not been regarded as being so profitable to cultivate as *Hevea brasiliensis*, but they nevertheless take a very high place amongst aborescent forms of useful latex producers, by virtue of their rapid rate of growth, hardy characteristics and good quality of rubber.

Four species are dealt with in the treatise: *M. Glaziovii*, *M. dichotoma*, *M. piauhyensis*, and *M. heptaphylla*. Their distribution, anatomy and morphology are described. Interesting remarks are made concerning the distribution of the laticifers in the stem of *M. Glaziovii*, and it would appear that if the tapping instrument were pressed down deep enough, it must every time puncture a laticiferous vessel except where it touched a medullary ray.

The volume by no means confines its considerations to the botanical aspects of the species. One instructive chapter deals entirely with methods of tapping, whilst the last six describe general research in connexion with the preparation of rubber. Even an account is given of the expenditure and revenue of plantations, so that the book will be seen to cover a very wide field. It should be interesting to the general reader, but of immediate value to rubber growers in German East and West Africa.

An interesting list has just been received of the trees, shrubs and climbers of the Gold Coast, Ashanti and the Northern Territories. It has been compiled by T. F. Chipp, B.Sc., F.L.S., Assistant Conservator of Forests, Gold Coast.

FUNGUS NOTES.

A DISEASE OF RICE.

Lately the importance of the soil as a source of infection of diseases of plants has become more and more recognized. C. N. Jensen, in America, has directly isolated from the soil, facultative parasites belonging to the genera Colletotrichum, Fusarium, Phoma, etc., besides the normally occurring parasites, belonging to Pythium and Phytophthora. Shaw in India has demonstrated the importance of the soil in regard to Rhizoctonia, whilst in the same country J. F. Dastur has observed that *Phytophthora parasitica*, which attacks the castor oil plant, retains its vitality in the soil for two months. In the West Indies, South has brought out the relation between soil conditions and root diseases of cacao, lime and sugar-cane. Not the least significant aspect of the subject is that which has arisen from the researches of Russell and Petherbridge on soil-sickness and partial sterilization, namely, that fungi in the soil may exert harmful influence on crops through the secretion of toxic substances.

Leaving these general considerations, attention will be given in the following article to results obtained lately by Shaw in India with regard to a new soil infecting disease of rice described in the *Memoirs of the Department of Agriculture of India*, Botanical Series, Vol. VI, No. 2.

NATURE OF THE PARASITE.

The fungus which causes the disease in question is known as *Sclerotium Oryzae*, Catt., and as the name implies, it is a fungus the mycelium of which produces hard masses of resistant pseudoparenchymatous tissue known as sclerotia. It will be remembered that sclerotia are characteristic of Rhizoctonia, too. In the case of the fungus under consideration it is hardly necessary to add that no perfect fruiting stage has been observed.

THE DISEASE IN THE FIELD.

Infected plants can usually be distinguished from healthy ones by means of the phenomenon of 'tillering', that is to say, the development of fresh green shoots from the adventitious buds at the base of the infected culm. The diseased culm gradually turns yellow and dies; any grain which it bears is light and poorly developed. It is the loss of grain which constitutes the most serious damage due to the fungus.

If a diseased stem be split longitudinally, the basal portion is found to be infected with the fungus. The hyphae from a dark greyish waft within the hollow stem, and small black sclerotia can be seen dotted all over the inner surface. At first sight the sclerotia resemble that of *Rhizoctonia Solani*, Kühn; they are, however, considerably larger and have a smooth shiny surface.

BEHAVIOUR OF THE FUNGUS IN CULTURE.

No matter where the material came from, nor whether the cultures were made from hyphae or sclerotia, the same fungus was always obtained. Cultures were made on several different media, and in some cases the medium was not without influence on the character of the fungal growth. For instance, infection upon nutrient agar containing extract of paddy grains induced the formation of chlamydospores in enormous numbers. Upon Lima beans, to give another instance, the fungus gave rise to a curious red pigment; whilst upon maize meal, the rate of growth was remarkably rapid, a dense white mycelium being formed in so short a time as twelve hours.

INOCULATIONS.

One of the most interesting, and at the same time most useful part of an investigation of the present kind is that which includes the artificial infection of the plants to see how far the fungus is an active parasite. *Sclerotium Oryzae* was found to be particularly vigorous as the following shows:—

'The young plants were infected when they were about seven to ten days old and about 3·4 inches high. The first series of infections was made with small black sclerotia from an agar culture about one month old. None of these inoculations gave any result, the sclerotia failing to germinate. Subsequent trials with sclerotia from old cultures showed that they had, not infrequently, lost the power of germination. Fresh inoculations were then made from a culture three days old, in which the hyphae were still growing vigorously, and sclerotia were not yet formed. A small speck of agar was removed from such a culture and placed upon a rice culm, about 1 inch above the remnant of the seed; hyphae quickly spread from this centre over the exterior of the culm, which gradually lost its green colour and turned brown near the seat of infection. As the outer leaf sheath turns brown, the lamina attached to it also loses its green colour and wilts; finally, the process extends to the central leaves, and the whole plant dies. During the progress of the infection a light weft of hyphae can be seen investing the culm; in the later stages of the disease small, dense, white aggregations of hyphae appear in this mycelium, and, ultimately, become hard black sclerotia of the usual type. This superficial production of sclerotia is a characteristic of the section Libera of this genus. We have, however, seen that sclerotia may arise in the more deep-seated portions of the host, so too much stress must not be laid on this character. The first sclerotia usually occur about the top of the first leaf sheath, either on its inner or outer surface; in the former case they appear as small dark swellings beneath the dry and withered leaf base. The time taken from the first infection until the death of the plant and the production of the sclerotia is about two weeks.'

On the whole, 70-80 per cent. of the inoculations proved fatal. It may be added as an interesting fact that a successful inoculation killed the infected plant completely, but, in the field, the result of an attack seemed rather to be a gradual weakening of the host, culminating in the failure to produce good seed.

REMEDIES.

Against a fungus like *Sclerotium Oryzae*, which can undoubtedly perennate in the soil, it is difficult to see what remedial measures can be employed with success. The application of sal-ammoniac to the soil has been suggested, but more probably efforts in the direction of breeding resistant varieties would answer a more useful purpose. Fortunately the damage done in India at the present time does not appear to justify any concern in regard to the immediate necessity for selecting special strains of rice resistant to the disease.

THE STERILIZATION OF SEED.

Several chemical reagents can be employed in the sterilization of seeds. The following extract contains a summary of the results, with regard to the use of hydrogen peroxide obtained by Ivy Massee, and published in the Kew *Bulletin of Miscellaneous Information* No. 5, 1913.—

The spores of fungi, also some kinds of bacteria, are as a rule killed by an hour's immersion in hydrogen peroxide; no spores experimented with germinated after similar treatment for two hours.

In nearly every instance the germination of seed immersed in hydrogen peroxide was retarded. Seeds immersed for four hours were, on an average, one to two days later in appearing above ground than untreated seeds of the same kind. Seeds treated for twenty-four hours were retarded two to eight days or in most instances were killed outright. The period of retardation is much less in seeds which germinate quickly than in the case of seeds whose germination is normally slow. After treated seeds have germinated, growth is rapid, and in a short time the plants are equal in size and vigour to the plants from untreated seeds sown at the same time. In some cases the plants from treated seeds are distinctly larger than those from untreated seeds at the end of three weeks. For all practical purposes, soaking seed in hydrogen peroxide for three hours will kill all superficial fungus spores and the seed will not be injured. This method is to be recommended as a substitute for fumigation, which, as a rule, does not kill fungus spores unless continued for such a time as to damage the seed.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

The Report of Mr. J. R. Jackson is as follows:—

The general tone of the markets during August, which is essentially a holiday month, has shown some improvement since our last report, not only in the amount of business done, but in an upward tendency of prices realized, though towards the close of the month some West Indian products, notably mace, and cassia fistula had dropped slightly. There has been but little doing in the case of

GINGER.

The offerings for the most part throughout the month have been bought in. On the 13th 105 bags of Calicut were brought forward and bought in at 31*s.* for bold, and medium brown, and 32*s.* for good washed; on the 20th of the month it was reported that 25 tons of Sierre Leone had been sold at Liverpool at from 20*s.* to 20*s.* 6*d.* At the last spice auction on the 27th, the offerings were bought in, bold lean at 65*s.*, and good small at 50*s.* per cwt.

NUTMEGS, MACE AND ARROWROOT.

At the spice auction on the 13th West Indian nutmegs were represented by 132 packages, all of which were sold at the following rates, 92's to 104's, 4¾*d.*; 113's to 130's, 4¾*d.* to 5*d.* and the same price for 138's to 147. Slightly wormy fetched 4¼*d.* to 4½*d.*, and wormy and broken 3¾*d.* to 4*d.* per ℔. A week later there was a steady demand and a good supply at an advance of ¼*d* per ℔., the whole consignment of 734 packages West Indian, being disposed of. Again at the concluding auction, on the 27th, the demand was steady at similar rates, but the supply was limited. For mace there has also been a steady demand, the 20 packages of West Indian offered being all disposed of at the following rates: fair to good reddish 1*s* 11*d.* to 2*s.* 1*d*, dark red 1*s.* 9*d.* to 1*s.* 10*d.* and broken 1*s.* 6*d* to 1*s.* 7*d.* per ℔. On the 20th of the month the offerings amounted to 167 packages of West Indian and all were sold, the higher qualities at previous rates, and the lower at a decline of from 1*d.* to 2*d.* per ℔. At the last auction on the 27th only small supplies were brought forward which were disposed of at previous rates. The large supply of 168 barrels of St. Vincent arrowroot was offered on the 13th and all bought in at from 2¾*d.* to 3¼*d.* per ℔. for fair to good manufacturing.

SARSAPARILLA.

It was not till August 21 that the drug auctions were resumed after a months interval for the holidays. In consequence of this the offerings of sarsaparilla on the above date were above the average, and consisted of 24 bales of grey Jamaica, 25 of Lima Jamaica, and 31 of native Jamaica, the whole of the first were disposed of at about 1*d.* per ℔. cheaper than previous rates, and realizing 1*s.* 8*d.* to 1*s* 9*d.* per ℔. for fair, 1*s.* 7*d.* for slightly rough and 1*s.* 6*d.* for part mouldy. The Lima Jamaica found no buyers the reserve price being 2*s.* per ℔. Seventeen bales, out of the 31 offered of native Jamaica sold at from 7*d.* to 8*d.* for dull red press packed, and 7*d.* for inferior yellow. One bale of fair red slightly mixed fetched 9½*d.* per ℔.

TAMARINDS, KOLA, LIME OIL, LIME JUICE AND CASSIA FISTULA.

At the first auction in the month, namely on the 6th West Indian tamarinds were steady, 15*s* being paid for good. East Indian, for which there was only a small demand, realized 13*s.* At the end of the month 72 packages of West Indian tamarinds comprising good bright; and dull dry Barbados were offered and all bought in at 18*s.* 6*d.* for the former and 16*s.* 5*d.* for the latter, kola was represented at the first drug auction on the 21st by 13 packages, 7 of which were sold, 5 bags being Jamaica, whole and halves, which realized 4½*d.* per ℔. and 2 bags of Grenada fair small halves and whole nuts part of which were dark in colour and mouldy, these fetched 3¼*d.* per ℔. Lime oil has been scarce throughout the month, fair West Indian distilled, from second hands being quoted at 3*s.* 8*d.* and hand pressed 13*s.* 6*d.* At the last auction 13 puncheons of raw West Indian, good palish green lime juice were offered but held at 1*s.* 6*d.* per gallon. At the same sale 20 bags of cassia fistula from St. Lucia were offered and 10 sold at 15*s.* the remaining 10 being disposed of privately.

During the year 1912, the crop of oranges and lemons in the district of Jalapa, Mexico, amounted to 90 million, and was principally consumed in the Republic, although part of the early crop was exported to the United States. It is believed that the growing of orange, lemon and other citrus fruits is likely to undergo development in this district, as the soil and climate are eminently suited for these fruits, which ripen two months earlier than those grown in the United States, to which country facilities for export through the port of Vera Cruz are good. (*Diplomatic and Consular Reports*, No. 5100—Annual Series.)

The *Dominica Guardian* (July 25, 1913) again refers to the congested state of the fresh lime market. It advises growers, in view of the rise in price of lime juice, to pick ripe limes rather than green, immature and undersized ones. It is stated that 8 barrels of fully ripe limes picked from the ground and sold at 4*s.* per barrel (the local price) is more profitable than picking between 10 and 12 barrels of undersized, green limes from the trees to sell at 5*s.* (the present New York price), or even at 6*s.* per barrel.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, September 9, 1913; Messrs. E. A. de PASS & Co., August 29, 1913.

ARROWROOT—2¾*d*. to 4¾*d*.
BALATA—Sheet, 2/6; block, 1/11½ per ℔.
BEESWAX—No quotations.
CACAO—Trinidad, 70/- to 77/- per cwt.; Grenada, 64/- to 69/-; Jamaica, 63/- to 68/.
COFFEE—Jamaica, 51/- to 100/-.
COPRA—West Indian, £33 5*s*. per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 15*d*. to 18*d*.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Very quiet, 37/- to 62/- per cwt.
ISINGLASS—No quotations.
HONEY—No quotations.
LIME JUICE—Raw, 1/2 to 1/6; concentrated, £26 5*s*. to £27 15*s*.; otto of limes (hand-pressed) 15/.
LOGWOOD—No quotations.
MACE—1/11 to 2/6.
NUTMEGS—4¾*d*. to 6*d*.
PIMENTO—Quiet, 2⅛*d*. to 2¼*d*.
RUBBER—Para, fine hard, 3/9; fine soft, 3/3; Castilloa, 2/2 per ℔.
RUM—Jamaica, 2/5 to 6/- per gallon.

New York.—Messrs GILLESPIE BROS. & Co., September 5, 1913.

CACAO—Caracas, 14½c. to 16c.; Grenada, 14c. to 14¼c; Trinidad, 14c. to 14½c.; Jamaica, 12c. to 13½c.
COCO-NUTS—Trinidad and Jamaica, selects, $41·00 to $43·00; culls, $26·00 to $27·00 per M.
COFFEE—Jamaica, 9⅞c. to 13c. per ℔.
GINGER—9¾c. to 10½c. per ℔.
GOAT SKINS—Jamaica, 49c.; Antigua and Barbados, 44c. to 47c.; St. Thomas and St. Kitts, 42c. to 44c. per ℔.
GRAPE FRUIT—Jamaica, $4·00 to $7·00.
LIMES—No quotations.
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SUGAR—American crushed, no quotations.

Barbados.—Messrs. JAMES A. LYNCH & Co., Ltd., September 20, 1913; Messrs. T. S. GARRAWAY & Co., September 13, 1913.

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CACAO—$15·00 per 100 ℔.
COCO-NUTS—$18·00
HAY—$1·50 to $1·60 per 100 ℔.
MANURES—Nitrate of soda, $70·00; Cacao manure, $48·00 to $50·00; Sulphate of ammonia, $82·00 to $85·00 per ton.
MOLASSES—No quotations.
ONIONS—$2·50 to $3·00 per 100 ℔.
PEAS, SPLIT—$5·25 to $5·50 per bag of 210 ℔.; Canada, $4·00 per bag of 120 ℔.
POTATOES—Nova Scotia, $2·40 to $3·00 per 160 ℔.
RICE—Ballam, $5·20 to $5·30 per 190 ℔.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, $4·00 per 100 ℔.

British Guiana.—Messrs. WIETING & RICHTER, September 13, 1913; Messrs. SANDBACH, PARKER & Co., September 12, 1913.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
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BALATA—Venezuela block	No quotation	——
Demerara sheet	65c. per ℔.	——
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OF THE
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VOL. XII. No. 299. BARBADOS, OCTOBER 11, 1913. PRICE 1*d*.

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The Fermentation of Cacao: A Review.

IN bringing together in his recent book,* six essays on the fermentation of cacao, written by experts of scientific eminence and practical experience, there can be no doubt that in one way Mr. Hamel Smith has performed a public service; for he has very effectively shown the great want of co-ordination in estate practice, and the lack of scientific investigation into the exact nature of the changes which take place during the plantation manufacture of the important product under consideration. The book is one which must attract attention. We feel, however, that from the grower's point of view, the work leaves something to be desired. Owing to the controversial nature of the subject dealt with, the book does not lead up directly to anything definite; it cannot therefore be merely read, but must be studied: points have to be taken separately and the views of the various writers sought for; and, in summing up these views and opinions, allowances have to be made for variations in local conditions and the degree of conclusiveness of the experiments or observations on which these views are based. It is true that in the last chapter entitled somewhat incongruously 'The Last Word,' we are given able critiques by Dr. Fickendey and others, but these, again, require sifting, and taking everything into consideration one feels sadly the want of the editor's guiding hand as one travels over the tortuous ground towards some hoped-for destination.

What is the fermentation of cacao? On one point all the writers agree, namely, that the process must be considered as consisting of two things. The first is the conversion of the sugar in the pulp into alcohol and then into acetic acid (vinegar), by means of the action of yeasts and bacteria. The second part of the process is not dispensed with quite so easily. As a matter of fact it would seem better not to regard it as a part of fermentation at all, but rather as the effect of it. According to Loew, Fickendey, Schulte and Sack, the second part of the change consists in the killing of the embryo or germ in the cacao seed through the heat evolved in the 'sweating', and the consequent putting into action of enzymes already within the nib. The action of these enzymes

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**The Fermentation of Cacao:* edited by Harold Hamel Smith. London, 1913.

produces the desired change of colour, and causes the conversion of astringent substances. Thus the fermentation proper is considered to be only of secondary importance. Nicholls, Preyer, Bainbridge and Davies, on the other hand, attach less importance to the conversion of astringent substances, and contend that there is a penetration of certain products of the external fermentation into the interior of the seed. Even Schulte recognizes that liquid substances are absorbed during fermentation.

The importance of the conversion of astringent substances is supported experimentally by the fact that the changes essential to the preparation of cacao may take place without fermentation if the germs in the beans are killed under conditions that leave the enzymes unimpaired. The report of brokers, nevertheless, appear, at present, to indicate that cacao so treated is not, other things being equal, of such good quality as cacao fermented in the ordinary way, though of much better quality than cacao not treated at all. In support of the beneficial effect of external fermentation on the quality of the beans, Hudson says, 'the higher the temperature attained and maintained for some days by primary natural fermentation, the better the class of cacao turned out.' So that, taking all these views into consideration, one is inclined to the opinion that, under existing conditions, the fermentation of the pulp does serve a useful purpose, not merely in regard to its removal, not merely because of the action of heat and acid on the oxidation of the seed, but also on account of the penetration of certain substances into, or at least their deposition on, the beans.

It is not maintained, however, that fermentation will always be necessary. On this point we are in agreement with Sir George Watt. And the view may by expressed that it will be the introduction of some mechanical system of curing that will most effectively meet the existing economic requirements of the cacao industry, namely, the output of uniform produce. Quite lately, in the *Agricultural News*, a brief account was given of Perroli's efforts to remove the pulp of cacao seeds by means of an alkali, and to induce the necessary changes in the sterilized seed reduced to powder. Success seems to have followed these efforts to some extent, and further investigation along this line is to be encouraged.

Assuming then, that, for the present, fermentation is desirable, what are the best ways of conducting the operation and what are the improvements that may be introduced? On these questions the book under review provides a great deal of information. Schulte recommends the Cameroon system of fermenting on floors as is done with malt in a brewery, though it may be pointed out here that the main contention of Schulte is that his oxidation process should be substituted for ordinary fermentation.

In spite of being somewhat drawn out, perhaps the best practical information on methods of fermentation is given by Hudson, who like most of the writers, attaches great importance to the 'changing' of the seed. As already indicated, Hudson considers the maintenance of a high temperature essential. (The temperature of even the bottom of the box should never fall below 100°F.) In this he is not in agreement with Hart, who has expressed the view that too high a temperature during natural fermentation is injurious.

A point of much interest is raised by Nicholls in regard to the inoculation of the beans with the yeast that causes the change of sugar into alcohol. His object is not to introduce a pure culture of the organism as has been proposed by Preyer, but merely to increase the amount, and to provide a mineralc ulture medium. Most of the writers support Nicholls' suggestion, but indicate the necessity for further investigation. In continuation of the subject of these fermentation organisms, Nicholls apparently contends that the fly known as *Drosophila melanogaster* conveys yeast to the fermenting cacao, whereas Bainbridge and Davies refer to this insect as a carrier of the acetic organism only. Probably it conveys both.

Closely related to the actual process of fermentation is the drying of cacao. Hudson does not seem to attach much importance to sun-drying, whereas several of the other writers do, on the score that the process works slowly, so that the air has time to penetrate into the bean, and to complete the process of oxidation. As regards drying machines, Hudson's essay provides very useful information. In this connexion the possibility of an extended employment in the future of the vacuum drier is of interest. The same writer's remarks on polishing machines should also be noted.

Nowadays, every manufacturing process must have its by-products. The fermentation of cacao, we are told, cannot be an exception to this rule. The world's output of cacao is, at present, about 227,500 English tons. According to Hudson, the fermentation of 200 lb. of cacao yields 2 gallons of vinegar, which would mean that 227,500 tons produce 5,096,000 gallons, valued at 2*s.* to 2*s.* 6*d.* per gallon[†] wholesale. The greater portion of this vinegar, during the process of fermentation, drains away and is wasted, and one must express agreement with the editor of the book under review, that growers should look into this matter more carefully with the object of increasing their profits by by checking what is, at present, both a waste and a nuisance.

Space will not permit the discussion of the many other points of interest and importance with which the book deals. Attention may be called to the close parallelism between the curing of cacao and tea, dealt with chiefly by Schulte, but also noted upon by Sir George Watt. Schulte's remarks concerning the tasting of cacao samples are likewise worthy of careful consideration.

AGRICULTURE IN THE EAST.

THE RUBBER POSITION.

In continuation of the subject of the price of plantation Para rubber, dealt with in a recent editorial in the *Agricultural News*, attention may be given to an important article concerning the possible over-production within the next few years, published in a recent number of the *India Rubber Journal* (August 30, 1913).

Briefly summarizing the views put forward by the writer of the article (Mr. C. C. Mallet), it may be stated first, that it is believed that in the near future there is considerable possibility of fine hard Para on the London market falling to 2*s.* 6*d.* per ℔. In considering how this drop would affect the price of plantation Para, it is pointed out that the present situation as regards prices and demand is artificial. At the present time there is no over-production, but there is great need for action to be taken in the direction of the standardization of plantation Para, in combination between the various Companies, and in the direction of attaining modifications in regard to Government specifications.

In 1916, estimates show that there will be over-production to a certain extent, but Mr. Mallet suggests that this could be stopped if the companies refrained from tapping for another year the newly planted areas coming into bearing. On the other hand, in 1917 a considerable over-production will have to be faced, for it is estimated that the yield will be 200,000 tons against a consumption of about 160,000 tons. This clearly indicates the necessity for restriction of output during 1917, and for several years to follow.

Coming then to the main point of Mr. Mallet's argument, it is seen that this restriction might be accomplished in two ways: (1) either by tapping each tree every other day; or, (2) by throwing out of tapping and upkeep for a year a large area and maintaining estates' staffs and labour at a low level. In view of the possibility of the spread of disease through neglect, and general depreciation, (1) commends itself as being the most suitable course to be followed. The object of the restriction would be this: The output of plantation Para would be limited to a certain extent, so as to allow a reasonable quantity of fine hard Para to remain on the market at 2*s.* 6*d.* to 3*s.* per ℔. Since the Brazilian supply could not be increased, and since by standardization and co-operation plantation Para had been recognized as being on the same commercial plane as the Brazilian product, the manufactures would have to pay the same price for plantation Para as for Brazilian Para.

If the output of plantation Para be unlimited, Brazilian rubber will be driven from the market, and prices will fall 'with a horrible slump.'

This important view Mr. Mallet supplements with lists of interesting figures showing the difference between the margin of profit for unrestricted and restricted production under the circumstances already described. If, in 1917, the market is allowed to be swamped with plantation Para, the price as already indicated, is bound to drop—possibly to 1*s.* 6*d.* per ℔.; and although unrestricted production would mean greater output, it would leave a margin of profit of only a few hundred pounds per annum from an area of 1,200 acres above the estimated profit on a restricted output. This small increase would have against it the enormous risk of not being able to dispose of half the rubber produced.

A highly articulated system of seed farms has been organized in the Central Provinces of India. This organization is described in an article by G. Evans, M.A., Deputy Director of Agriculture, Northern Circle, Central Provinces, in the *Agricultural Journal of India* for July 1913. Briefly stated, the Government undertakes to produce seed at a central farm. In co-operation with this farm are the leading land-owners who also raise seed supplied from the central station. Under these come district Agricultural Associations who are again divided into Agricultural Unions. Incorporated with the Agricultural Unions is a central seed store which registers orders for seed, and arranges the supply from the incorporated seed farms. It also arranges for the disposal of surplus produce in bulk. The seed is graded by a specially trained man, and thus no seed not up to standard is sold for sowing from the seed farms,.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados on Monday, October 6, 1913, by the R.M.S. 'Tagus' after three months' duty leave spent in England.

It is stated in the *Louisiana Planter* (July 26, 1913) that an asbestos roofing has been found to put a stop effectively to conflagrations. The roofing is composed of a felt made from asbestos rock reduced to fibres. Layers of this stone felt are cemented together with Trinidad lake asphalt, the whole forming a roofing that is literally a sheet of flexible stone. It may be added that since asbestos, as well as being incombustible, is a bad conductor of heat, its employment for roofing purposes in the Tropics should tend to lessen the internal temperature of the buildings on which it is placed.

[†] These figures are quoted from page XXXIV of the Preface; but they seem rather high.—[Ed. *A.N.*]

FRUIT AND FRUIT TREES.

MANURIAL AND SHADING EXPERIMENTS WITH CACAO IN CEYLON.

It has been established in the West Indies, particularly at Dominica, that the most remunerative form of manurial treatment for cacao is mulching, and, to a less extent, the application of cotton seed meal. Results somewhat different to these have been obtained in Ceylon.

In Bulletin No. 5, issued by the Department of Agriculture, Ceylon, a table of figures is given which sets forth the results of the cacao manurial experiments at Peradenyia, 1906-12. In this it is seen that the unmanured or control plot gave 2·6 cwt. of cured cacao, whereas the application of sulphate of ammonia, at the rate of 250 ℔. per acre, to another plot of the same size led to the production of 6·0 cwt. of cured cacao. A similar increase resulted from the application of 107 ℔. per acre of potassium chloride. These manures just mentioned produced the maximum increased yield. Trenched and buried debris with lime applied at the rate of 10 cwt. per acre led to the production of 4·2 cwt of cured cacao; basic slag (at the rate of 250 ℔. per acre) buried with lime and twigs also gave 4·2 cwt.; trenched and buried debris with 10 cwt. of lime and forked round, resulted in a yield of 3·6 cwt.; cattle manure forked in round the trees (at the rate of 10 tons per acre) gave 4·0 cwt.; ground nut cake (at the rate of 896 ℔. per acre) gave 5·0 cwt.

It is stated in the bulletin that these results are published as records, not with a suggestion that any finality has yet been reached, since subsidiary influences will require many years to be eliminated. That influences other than those exerted by the manures applied are at work, is indicated by the behaviour of the unmanured plots, No. 37 giving over 100 per cent. more cacao than No. 32.

Turning to the subject of the shading experiments dealt with next in the publication, the figures presented clearly indicate the evil effects that may follow from not shading, or insufficiently shading, young plants. In the table of results it is seen that the percentage of survivals in 1912 of original trees was as follows: no shade, 37; low shade, 57; high shade, 88.

It is added that no further records will be kept of the shade effects, since they cannot have a very wide application, as localities with different elevations and rainfall require different treatment.

ANONACEOUS POSSIBILITIES FOR THE PLANT BREEDER.

A consideration of a very apposite nature is pointed out by P. J. Wester, in the *Philippine Agricultural Review* (July 1913), to the effect that the reason why many tropical fruits lack that distinction and flavour which characterize fruits of temperate countries is because fruit culture in the Tropics has never been the subject of very systematic selection work.

One of the most interesting groups of plants to which the plant breeder in the Tropics may devote his attention, is the genus Anona (see *Agricultural News*, Vol XII, p. 68). including some sixty or more species, and the closely related Rollinia, with over twenty species belonging to the family Anonaceae, of which an unusually large number of species bear edible fruits. It may be noted in passing, as an interesting botanical fact, that nearly all the Anonas and all the Rollinias, so far described, are indigenous to the New World, nine species of Anona having been discovered in Tertiary deposits in Europe.

From the economic aspect, the value of the species of these genera lies not only in the usefulness of their fruits, but also in the unusual vigour of their growth, their wide distribution under different conditions, and their decorative value.

LITTLE-KNOWN SPECIES OF ECONOMIC VALUE.

The main object of the paper from which the above considerations have been abstracted is to supply a more or less complete list of the different species together with their more pronounced characteristics. Amongst this list it may be of interest in the West Indies to call attention to *A. cacans*, Warm., an attractive tree with edible fruit. This plant, like those which follow, is indigenous to Brazil. *A. geraensis*, Barb., is a shrub 1 to 2 metres high with yellow flowers and aromatic fruit with white flesh. It is noted, in regard to *A. glabra*, L. (the Mamon), that this has been found a satisfactory stock for the cherimoya, the custard apple, the sour sop, and it appears promising for the Biriba (*Rollinia orthopetala*, [A.] DC.) too. This latter tree, also a native of Brazil, possesses a rapid and vigorous growth, attaining to a height of 10 metres. It has been said that its fruit grows as large as a child's head, but according to more authentic accounts, this statement is an exaggeration. The flesh of the Biriba is white, sweet and deliciously flavoured.

Reference is also made, in some detail, to the characteristics of the sugar apple, sour sop, cherimoya, marolo and other fruit trees well known in the West Indies; but the point which is emphasized in general, is that the quality of these and the fruits specially referred to above, could be vastly improved by hybridization and careful selection.

COST OF ESTABLISHING A COCO-NUT PLANTATION.

Interesting estimates are put forward in Bulletin No. 25 entitled The Philippine Coco-nut Industry, issued by the Department of Public Instruction, Manila, to show the expenditure and the revenue during the first ten years of a 2,500-acre coco-nut plantation on an island in the Philippines.

The following figures are reproduced from these estimates:—

	Expenditure.		Revenue.
	$		$
First year	41,606	Sixth year	27,270
Second ,,	35,906	Seventh ,,	54,545
Third ,,	32,281	Eighth ,,	86,360
Fourth ,,	23,581	Ninth ,,	115,905
Fifth ,,	35,331	Tenth ,,	131,815
Total	168,705 (=$67·50 per acre.)		

For the sixth year, and those which follow, the expenditure is put down at $25,000 per annum. After the tenth year the revenue would remain constant at about $136,000, giving a net income per annum of $111,360, and hence a dividend of 87 per cent.

SUGAR INDUSTRY.

CLARIFICATION OF CANE JUICE BY ELECTRICITY.

One of the latest and most interesting topics in the sugar industry is the clarification of cane juice by electricity. The following table of figures which, it is claimed, show the changes which the electrolytic process* induces, are taken from the *Louisiana Planter* (August 9, 1913):—

	Before treatment.	After treatment, the liquid decanted.
Beaumé	12·00	10·40
Density	10·89	10·76
Solids	21·45	18·50
Sucrose	17·10	17·89
Water	78·45	81·50
Purity	79·72	96·70
Glucose	0·29	0·328
Ashes	0·04	0·031

In the issue of the same journal for September 9, 1913, E. W. Ludwig discusses the criteria of the industrial possibility of the idea. The greater portion of this discussion devolves upon the results tabulated above, which, it is stated, have little bearing on the practical question as to whether the process can be made an industrial success.

The criticisms of the writer referred to above on the figures quoted, may be summarized as follows:—

(1) Owing to the fact that the electric current induces precipitations, combinations and the evolution of gases, the first three lines of figures which deal with specific gravity show nothing definite.

(2) In the fourth line, the higher percentage of sucrose shown, is inconclusive, because the process leads to a loss of water by evaporation. The higher percentage of sucrose in the juice after treatment is not necessarily proof of this loss of water, because some of the soluble constituents of the original juice have been precipitated.

(3) The extraordinarily great increase in purity is regarded with suspicion on general grounds.

(4) The glucose percentages have no significance because the sucrose figures are unreliable.

(5) The accuracy of the ash determinations is questioned because (a) they are very abnormal, (b) other investigators have found that the electrolytic process increases the ash percentage.

(6) Changes in regard to acidity, of considerable importance, are not given.

PROPER TECHNICAL WAY TO APPROACH THE SUBJECT.

The article under consideration then gives a list of the data required before the industrial feasibility of electrical clarification can be established:—

(1) Operating expenses: (a) consumption of electrode per litre of juice treated; (b) consumption of electricity per litre of juice treated; (c) extra supervision and labour; (d) price of electrode material.

(2) Time taken to clarify a certain volume with an apparatus of specified size.

(3) Percentage loss (if any) of sucrose in treatment.

(4) Decrease in acidity of 10 c.c. of juice by treatment.

(5) Increase of true purity.

To avoid experimental errors, 20,000 gallons of juice should be employed to obtain data (1), (a), (b), (2), (4), and (5), which should all be determined on the same juice whose purity should be stated.

LOSS OF ELECTRODE AND OF SUGAR.

In elaborating these points it may be added that the question of the consumption of electrodes is an important one. Only electrodes constructed of material that can undergo chemical changes have proved practicable in the process, although it is stated by Warren (*Louisiana Planter*, August 9, 1913) that Murphy has invented a metal (alloy) which undergoes no appreciable loss, whilst answering satisfactorily requirements as regards clarification. This Ludwig describes as 'downright, unblushing alchemy.'

Recognizing the fact that the electrodes must undergo some change, it is, to continue the main point at issue, important that they should be constructed of a metal which is cheap and readily available in large quantities. Aluminium answers this purpose satisfactorily from a chemical aspect, but the fact that the metal is in the hands of a few corporations who may at any time combine to force the price up, has to be taken into careful consideration.

Finally, in regard to determinations concerning loss of sugar, it is essential to work first with artificial juice containing no sucrose, in order to prove definitely that there is no destruction of glucose. This information would enable the glucose ratio to be used as a reliable test for sucrose. The only other way to determine the sucrose would be to obtain the weight of sucrose present in a certain weight of the juice. This would be a longer process, but more preferable.

It has already been noted that acidity figures have not yet been given. Ludwig believes that the question of acidity will be found to be of great importance, and that even if the electrolytic process is introduced, as it probably will be, the employment of lime for neutralization purposes will never be entirely dispensed with.

THE WORLD'S CANE SUGAR INDUSTRY.

Recently the above book has been reviewed in considerable detail by G. Clarke, F.I.C., Agricultural Chemist to the Government of the United Provinces, in the *Agricultural Journal of India* (July 1913).

The general conclusion arrived at is that the most valuable and interesting information from different countries is given, in the book, on the following points: (1) the price of cane; (2) the out-turn of sugar per hundred cane; (3) the yield of sugar per acre.

It is shown in the article acknowledged above that the price of cane in Cuba is not high in spite of the scarcity of labour, owing to ratooning. In Hawaii, however, because of labour difficulties, the price is high, but is somewhat compensated by a big out-turn of sugar.

In conclusion it is suggested that it might be found desirable in a new edition to present a little more information in regard to the working of the central factory system in the West Indies,—information which would be welcome to East Indian readers.

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* It may be explained for the benefit of the general reader that the electrolytic process consists, in principle, in passing an electric current through a liquid in which are immersed two metal plates each of which is attached, respectively, to the two poles of a generating plant. The current passing through the liquid from one plate (or electrode) to the other, sets up chemical changes between the material composing the plates and the liquid, or the substances dissolved in the liquid.—[Ed. *A.N.*]

FIBRES.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date September 22, with reference to the sales of West Indian Sea Island cotton:—

Since our last report the largest buyers of West Indian cotton were approached, with a view to moving off the stock, and, although they have no immediate want of cotton for several months, they have relieved the situation by purchasing about 1,300 bales, and these will probably have to be stocked for several months before being used.

The sales include about 500 bales St. Vincent chiefly from 19*d.* to 20*d.*, with a few lower lots at 16½*d.* to 18*d.*, and better parcels at 21*d.*; about 400 bales Antigua, chiefly 16½*d.* to 17½*d.*, and the remainder composed of St. Martin, Nevis, Montserrat, Anguilla, St. Kitts, St. Croix, Barbados and St. Eustatius, from 16½*d.* to 17½*d.*, together with very superior stains at 11*d.* and off-coloured cotton 13*d.* to 15*d.*

Whether these sales will lessen the demand for early new crop cotton when it comes forward, depends largely on the quality. If the crop is better than last season, spinners might continue to add to stock; otherwise they naturally are not in immediate want.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending September 20, is as follows:—

With the exception of a sale of 28 bales Extra Fine off in preparation, of old crop cotton, the market remains quiet and unchanged.

Of the new crop, the receipts this week were only 3 bales, making 6 bales to date, and it probably will not be before the early part of October that the receipts will be sufficiently large for any of the new crop to be shown on the market. We nominally renew our last quotations:—

Extra Fine	28c. to 29c.	= 16*d.* to 16½*d.*	c.i.f., & 5 per cent.
Fully Fine	26c. to 27c.	= 14¾*d.* to 15¼*d.*	,, ,, ,, ,,
Fine	25c.	= 14¼*d.*	,, ,, ,, ,,
Extra Fine off in preparation	24c. to 26c.	= 13½*d.* to 14½*d.*	,, ,, ,, ,,
Fully Fine off in preparation	22c.	= 12½*d.*	,, ,, ,, ,,
Fine off in preparation	20c.	= 11½*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre up to September 20, 1913, were 311 bales, 397 bales, and 50 bales, respectively.

Cotton Problems in Louisiana.— Circular No. 130 of the Bureau of Plant Industry, United States Department of Agriculture, suggests the following measures of improvement in regard to cotton cultivation in Louisiana: (1) The investigation of new long-staple varieties of cotton and improved cultural methods; (2) the organization of cotton-growing communities, particularly in regard to protection against the boll weevil; (3) the education of the consumer regarding the value of long-staple cotton as a means of securing strength and durability in clothing and other textile products; (4) the acclimatization of other tropical crops to ensure a diversification of agriculture.

THE KAPOK INDUSTRY.

Much information concerning kapok or silk cotton, the product of the tree *Eriodendron anfractuosum*, has been given in the *Agricultural News* (see Vol. XI, p. 324). Recently the Department of Public Instruction of the Philippine Islands has issued a Bulletin (No. 26) which describes the various details of this important industry. As regards the possibilities of its development in the Philippines, the writer of the Bulletin offers the following remarks:—

Heretofore the principal drawbacks to the production of kapok in the Philippines for export purposes have been the ignorance of the producers as to the full merits and value of the product in the markets of the world, and also the lack of suitable machinery for cleaning it. These drawbacks may be said to have now been eliminated. The necessary information has been given to both producers and local buyers, suitable machines of large and medium capacities are now available, and it is now hoped that the industry will develop in response to the increasing demand for the product, and to the extent warranted by its admirable qualities.

The principal steps in the kapok industry which claim the attention of the prospective producer and upon which depends his ultimate success are: First, the judicious selection of a location having suitable soil and climatic conditions; second, the necesssity of raising kapok on a large scale or in localities of sufficient propinquity; third, the adoption of the proper cultural method by which kapok can most economically and conveniently be raised; and fourth, the use of modern machinery for cleaning and baling the product, as well as the exercise of judicious methods in the handling of it prior to and after cleaning.

A careful review of the statistics showing the production and value of kapok floss and seed in Java will conclusively prove that a serious attempt toward the establishment of this industry in the Philippines is justified. The Bureau of Agriculture is well satisfied with the outlook for this industry, and several communications have recently been received from a number of manufacturers in the United States who are desirous of handling the Philippine product, and who have quoted prices ranging from 65 to 90 centavos per kilo, laid down in New York or San Francisco. These facts, together with the facility of raising kapok in the Philippines and its freedom from any dangerous enemies or disease, should recommend to the attention of the Philippine planters as well as the Philippine buyers and exporters, the advisibility of building up this industry and endeavouring to supply the larger part, at least, of the American and Australasian markets. The Java product enters the United States market free of duty; and our product must, therefore, for the present at least, compete on even terms. As regards the Australasian market, both Java and the Philippines are also on the same footing; this is no reason, however, why the latter should not be able, in the near future, to supply a large part of the demand from the neighbouring British Colonies.

The possibility of establishing a kapok industry in the West Indies is not very hopeful, owing to the comparatively small size of the estates bound up in other interests. Isolated silk cotton trees occur, however, and the fibre should always be collected where possible, unless, as in St. Vincent, it is desirable to destroy these trees owing to their harbouring a pest of a fibre that is far more valuable than kapok.

AGRICULTURAL ENGINEERING.

MECHANICAL EXTRACTION OF RUBBER.

About two months ago, the Hon. W. L. Thornton of Tobago wrote to this Office for further information in regard to the rubber-extracting machine known as 'Valour', a note on which appeared in the *Agricultural News* for July 5, 1913. Mr. Thornton suggested that the machine might be of use in connexion with Castilloa. The matter was followed up immediately, and we are now in receipt of fuller information, forwarded from Paris, from the Agency of the Valour Rubber Extracting Machine, Ltd, whose Head Office is at 31, Copthall Avenue, London, E.C.

KINDS OF RUBBER EXTRACTED.

So far, the machine—which will be described later in detail—has been employed chiefly for the extraction of root rubber (*Landolphia* spp.) and rubber from Maniçoba (*Manihot* spp.). It is stated by Professor Jumelle of Marseilles in *le Caoutchouc et la Gutta-Percha* (December 15, 1912) that the machine might be used in the case of Funtumia trees also. No details, however, are given. There can be no doubt that the method is best suited to the extraction of Landolphia, because in the rhizomes of these plants, the latex exists in a coagulated form and merely requires separation. In other words, tapping is impossible. It may be noted, in continuation of this point, that Landolphia rubber extraction is one of the main industries of East Africa. In his book, Mozambique: Its Agricultural Development, Mr. R. N. Lyne (Director of Agriculture, Ceylon) says: 'I am convinced that without machinery, root rubber cannot be profitably worked.'

Although the usefulness of the machine for root rubber can be regarded as established, the point of immediate interest in the West Indies is—Can it be economically employed in any way for *Castilloa elastica* and for Jequié Maniçoba (*Manihot dichotoma*)? This latter species appears to be well adapted for growth in the drier islands, and considerable areas of Castilloa are already established in Trinidad and Tobago, and to a less extent in Dominica and Grenada. The machine economises labour, and Castilloa yields *by tapping* are low. The answer to the above question may best be preceded by a short account of what the machine has been found capable of doing.

WORKING OF THE MACHINE.

Each machine is composed of a large cylinder, the sides of which are perforated. It is mounted horizontally on iron bearings and revolves at the rate of forty-five revolutions a minute. Inside the cylinder are five iron rollers, each weighing 37·5 lb., which are free, so that when the machine is put in motion, these continually come into contact with, and completely pulverize, the bark which has previously been introduced. Water is passed in through a pipe. This together with all the debris leaves the cylinder through the perforations, and after an hour or so nothing remains within the cylinder but pure rubber.

Each machine requires 3 h.p. to drive it. Generally it is economical to employ a battery of six machines, and a 24 h.p. engine. Each cylinder is able to receive 70·5 lb. of bark. A battery of six will deal with about 400 lb. in an hour and a half.

SPECIAL ADVANTAGES.

It should be noted here that the arrangement can work without water—a very important feature under certain circumstances. Other advantages are that the machines can be operated either by motor power or by hand, and that no part of the machine is too heavy for a man to carry.

COST.

The installation of a battery of six machines with a 24 h. p. engine, and all accessories, at a point not more than 50 kilometers from the nearest railway station or shipping port, costs 50,000 francs (about £1,960). The total working expenses are put down at 410 francs (about £16) per day, and under average conditions this should leave a net profit of 790 francs (about £31) per day. These figures refer to large exploitations of root rubber. In the West Indies a single cylinder worked by hand power would probably only come within the bounds of practical considerations.

THE MACHINE AND CASTILLOA EXTRACTION.

O. F. Cook, in Bulletin No. 49 of the United States Department of Agriculture, discusses the possibilities of extracting latex from the temporary branches and the unripe fruit of of Castilloa. It is a point worth bearing in mind, that the machine under consideration might serve a useful purpose in this respect. Of course, it must be remembered that the machine is more in the nature of a separator than anything else, and in this respect it might be useful for cleaning scrap rubber that has coagulated on the trees. The point may be raised as to why it is that Castilloa with continuous tapping gives lower yields. The question does not seem to have been raised as to whether it may not be due in part to the coagulation of the latex in the bark. If this were so, the possibility of barking Castilloa would be worthy of consideration, and then the question of the employment of the rubber-extracting machine would be a very vital one.*

Alcohol as a Motor Fuel.—If it could be definitely decided whether motors for agricultural work can be constructed to use alcohol instead of petrol as a fuel, it is believed that the question of employing alcohol as a motor fuel would be of very great agricultural importance. According to *The Times* (July 22, 1913) Mr. E. G. Evans, representing the South African Agricultural Union has maintained that, under the foregoing conditions, if only motor fuel could be produced from a growing product such as maize, the benefits would be very great. It is suggested in continuation of this view, that engineers should direct their attention immediately to the construction of motors suited for use with alcohol.

The whole subject is of much interest, in view of the great importance which is now being attached to motor cultivation in places where the soil is heavy, or where labour is scarce, or where the tsetse fly will not allow cattle to work. It may be added that the subject is of particular significance when considered in conjunction with the views put forward in the editorial of this issue, in regard to the manufacture of alcohol during the fermentation of cacao.

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*It would be useful to have the views of Castilloa growers on this subject.—[Ed. *A.N.*]

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number comprises a review of a recent work on the fermentation of cacao.

On page 323, will be found an article containing suggestions in regard to the action that should be taken by growers of plantation Para rubber, in view of the likely over-production which will occur in a few years' time.

Under the general heading of Sugar Industry, on page 325, will be found an article reviewing recent work on the clarification of cane juice by electricity. Suggestions as regards future investigation are given.

On page 327, will be found an article dealing with the mechanical extraction of rubber. Particular attention is given in this article to the possibility of employing a machine in connexion with *Castilloa elastica.*

A note and comment on this page deals with an interesting aspect in regard to the effect of the Reciprocity Agreement between the West Indies and Canada.

Insect Notes, on page 330, contain several articles of much general interest.

Four articles are given on page 335 in this issue, dealing with Soil Investigations.

An account of some interesting Japanese work will be found under Fungus Notes, on page 334.

Exports from West Indies to Canada, 1912-13.

Owing to the fact that 1912-13 covers the last trading period previous to the coming into operation of the Canada West India Reciprocity Agreement, the *Canada West India Magazine* (August 1913) has reviewed at considerable length a recent Canadian Report on the trade between the two countries for that year. It is stated in the article, that the report can be regarded as a suitable standard by which all future trade operations can be gauged and the success of the Agreement measured. We hardly think so. As Mr. Mousir, the writer of the review himself points out, there was a considerable decrease in the trade during 1912-13, occasioned principally by the occurrence of severe droughts in the West Indies. There was an actual drop in value of West Indian exports to Canada amounting to $1,128,000 and of Canadian exports to the West Indies, of $113,000.

Care must be taken in attributing any improvement which may take place this year to the effects of the Agreement unless the climatic conditions in the West Indies are the same as last year.

Only under such conditions will it be possible to gauge at all definitely any beneficial influence that may accrue from the reciprocity arrangement in regard to total trade, though of course the ratio between West Indian trade with the United States and Canada is another matter

The Future of Tropical America.

Profusely illustrated with most excellent photographs and containing a detailed account of the agricultural and social conditions in the tropical states of America and in the West Indies, the publication of the Tropical Exploitation Syndicate, Limited, bearing the above title, should prove both attractive and useful to those who contemplate investing capital in Central America.

For purposes of description, the countries are divided into four groups. The fourth group includes Trinidad. In connexion with this fact it may be noted that a further series of articles on the West Indian Islands is now in course of preparation. At the end of the publication an account is given of the systems of cultivation of coco-nuts, cacao, coffee, limes, sugar, bananas, and pine-apples.

The only disappointing feature of the publication is that the title leads one to expect that something definite will be said concerning the opportunities and scope for capital and labour in the different countries dealt with. The main theme is that the Panama Canal will entirely transform Central America from the economic point of view. On this subject the writer of the publication offers some very soul-stirring remarks, of which the following is a specimen: 'Here are a number of countries among the richest in the world in mineral wealth, in soil and in natural products, which have until now, been more or less cut off from the markets of civilization. At present Asia is practically closed to the exports of these countries —by sea, by the long and dangerous passage, marked by thousands of shipwrecks, round Cape Horn, and by land by the difficulties of the Andes, stretching their vast and rugged bulk from Panama on the North, to the extremity of Patagonia on the South. For the future the easy passage of the Canal will be theirs. The eastern and western hemispheres will meet at their doors and bring with them a Pactolean flood that will, it is believed, metaphorically turn their soil into gold. Upon these countries the eyes of the keenest business men of the world are fixed, and it is here that the next few years will see development unparalleled in the world's progress. Everything conspires to promote their development, and land which hitherto it had not paid to cultivate beyond the immediate necessities of the inhabitants, will appreciate in value as markets for its produce insatiable and lucrative, are opened within easy access.

It is to be hoped that this will be so.

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Opportunities for Planters in British Honduras.

In continuation of this subject of the latent agricultural wealth in the Tropics, attention may be called to an article which has just appeared in *The Field* (August 23, 1913). The writer of this account, after referring to the diverse crops which can be grown in the Colony, calls attention to the tribute paid to British Honduras by Sir Daniel Morris, when he said, thirty years ago, that in the surpassing richness of its soil, in its wonderful facilities for the growth of numerous tropical plants, and in its proximity to, and close connexion with, the large and increasing markets of the United States and Canada, this Colony possesses advantages unequalled by any country in the East Indies.

In the face of these facts the writer seeks to explain the cause of neglected opportunities in British Honduras. It has been said that agricultural progress is retarded by difficulties of labour; but it has to be remembered that with the completion of the Panama Canal a large number of Barbadian and Jamaican labourers will be out of employment. Moreover, there are in British Honduras various tribes of Indians who would make, it is said, excellent agricultural labourers, and would be willing to work for low wages.

◆

Periclinal Chimeras.

It is yet too early to form an estimate of the economic value of Dr. Winkler's discovery that it is possible to clothe one species of plant in the skin of another. Considered in relation to certain observations that will shortly appear in an article on the stomatal characteristics of varieties of sugar-cane in the *West Indian Bulletin* (Vol. XIII, No. 4), the existence of periclinal chimeras—the name applied to the above-mentioned class of hybrid—opens up new lines of thought that cannot be disregarded in the future by plant breeders and those interested in genetics generally.

In the *Journal of the New York Botanical Garden* (August 1913), Dr. A. B. Stout gives a highly instructive historical account of recent work on graft-hybrids, in which Dr. Winkler's work predominates. This investigator grafted the tomato and nightshade—two distinct and well-marked species. When the scion was well established, he decapitated the branch, cutting through the points of contact between the scion and stock, thus exposing on the cut surface the two kinds of tissue and the two lines of contact between them. On this surface a callus formed from which buds arose. If a bud arose entirely from a portion that was nightshade the branch was purely a nightshade in its characteristics; if from a segment of tomato tissue, the branch was pure tomato. If, however, a branch arose over the line of juncture, it was composed partly of tomato and partly of nightshade tissues.

In continuing his experiments, Dr. Winkler obtained from an adventitious branch, plants that were neither tomato nor nightshade, though with one exception, each resembled the tomato more closely than the nightshade, or vice versa.

It was at first thought that these new plants were real graft-hybrids, resulting from the fusion of the vegetative cells of the two original species. Microcopic examination—prompted by Baur's discovery that white-bordered leaves have peripheral layers of white cells covering green ones—showed that one of Winkler's hybrids which resembled somewhat the tomato, had really a nightshade body covered with tomato cells. Another had a tomato body covered with nightshade cells.

It may be added that, at present, the only true graft-hybrid known appears to be *Solanum Darwinianum*. This plant is really the result of vegetative cell-fusion.

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Proposed College of Tropical Agriculture in Ceylon.

A brief reference to this subject was made in the last issue of the *Agricultural News*. From an article in the *Tropical Agriculturist* (August 1913) it appears that the scheme which has been put forward is purely tentative and that nothing definite has as yet been decided upon in regard to the building of the institution. The article under consideration is accompanied by suggested designs for the college, which, it is proposed, shall be situated at Peradenyia. The cost of the proposed buildings, as designed, would be about £38,000.

The subjects which the institution proposes to teach include the ordinary ones in which instruction is given in agricultural colleges. Dealing with the question of the teaching staff, the article makes very sound suggestions, particularly in regard to the Principal, whose ability as an organizer, and educationist, and as a specialist in tropical agriculture would be of the greatest importance. Much, it is believed, would depend upon getting the right man for the head of the college, and it is suggested that before any further action is taken, a Principal should be appointed who should superintend the construction of the buildings and their equipment, and arrange in advance the preliminaries of general administration.

INSECT NOTES.

HOW TICKS ARE KILLED IN THE DIPPING OF CATTLE.

The *Agricultural Journal of the Union of South Africa* for July 1913, contains an interesting article by H. E. Laws, B.Sc., F.I.C., giving the conclusions arrived at after a series of experiments designed to demonstrate the manner in which ticks are affected by the soluble poison (arsenic) in the dipping mixtures with which tick-infested cattle are treated in that country.

Three theories have been advanced by different investigators: These are (1) that the tick absorbs the poison through its skin while the animal is passing through the dipping bath; (2) that the absorption of the poison through the skin of the tick takes place after dipping; (3) that the beast absorbs the poison into its skin, and the tick sucks in the poison with the juices extracted in the process of feeding.

The experiments are stated to demonstrate conclusively, that the method expressed in theory (3) is the one by means of which the poison in the dipping solution is communicated to the tick, and that it is impossible that the poison should be absorbed in the manner suggested in theories (1) and (2).

The conclusions seem to be supported by the fact that ticks do not gain weight during the process of dipping or immediately afterward—indicating that no absorption takes place at those times; and further, that when soluble arsenic solutions are injected subcutaneously into cattle, the ticks at the point of injection and within a short radius (about 6 inches) are killed, and a subsequent analysis demonstrates the presence of arsenic within the bodies of the ticks.

It is shown, moreover, that the arsenic taken up by the skin of the cattle does not enter the blood stream, being retained in the lymphatic parts, whence it is extracted by the ticks with the juices of the skin.

The most efficient arsenic-containing dip is one which penetrates to the skin uniformly on all parts of the body, and it has been found that when the arsenic solution is combined with an oil emulsion this result is best achieved.

The same arguments in favour of the arsenic and emulsion combination would apply in the case of animals treated by spraying, as well as by dipping.

It will be noted that these tests were made entirely with reference to solutions acting as internal poisons, and the results would not be applicable in connexion with the use of mixtures having a purely external effect, i.e. contact poisons, of which kerosene oil is a good example.

SUGAR-CANE PESTS IN QUEENSLAND.

The Queensland Department of Agriculture and Stock has recently issued Bulletin No. I, entitled The Cultivation of Cane Upon Old Lands, by H. T. Easterly, General Superintendent of Sugar-cane Experiment Stations.

The subject is dealt with under two heads: (1) restoration of old land, and (2) planting, subsequent cultivation, methods of ratooning, and application of manures. Under the second of these heads, the pests and diseases of cane are discussed in a brief note, which is reproduced below. The account of the severity of the attacks of the scarabaeid beetles is of interest in connexion with that of the root borers and other grubs in West Indian soils, which appeared in the *Agricultural News*, Nos. 285-290, and which is now being issued as No. 73 of this Department's Pamphlet Series:—

The sugar-cane plant in Queensland is subject to many pests and diseases. The most serious of these, at the present time, is the grub pest. The larvae of Lepidiota and other scarabaeid beetles attack the roots of the cane, causing the stool ultimately to fall and perish. Thousands of tons of cane, particularly in the north, have been destroyed every year, and a high price, per ℔., is now paid for the beetle. In Mackay, over 15 tons of beetles have been captured within so short a time as two months, and destroyed. The weevil borer (*Sphenophorus obscurus*) and the moth borer (*Diatraea saccharalis*) do a certain amount of damage, but have not so far called for urgent repressive measures. The gumming disease of the cane caused by *Bacillus vascularum*, Cobb, is at times a very serious trouble, both in the field and in the mill, but so far as the writer's experience goes, gumming of the cane is not found to any extent north of Mackay, and appears most prevalent in cooler climates. Sets showing gum should never be planted. Certain varieties of cane, particularly the older sorts, such as Rose Bamboo and Striped Singapore, are particularly liable to the disease, while in the best of the New Guinea canes no traces of it have been found, though the poorer kinds are far from immune. An entomologist, in the person of Mr. A. A. Girault, is at the present time investigating the grub pest, but until his enquiries bear fruit, the methods of grub and beetle destruction are the best that can be undertaken at the present time. One thing appears evident—that where the grubs and beetles have been systematically destroyed over a period of years, the pest is doing little or no damage.

Nematodes and fungoid diseases attacking roots are also causing alarm in places. The liming of the soil, change of plants, and rotation of crops are the surest and safest methods for the elimination of these troubles.

SUCCESSFUL TRANSPORTATION OF MILLIONS TO THE EAST.

Another attempt is now being made to introduce Millions (*Girardinus poecilloides*, de Filippi) into the Federated Malay States, in connexion with the work of mosquito control in that Colony.

Early in June of this year a consignment of these small fish was sent from Barbados by the Imperial Department of Agriculture by the R.M.S. 'Tagus'. In England the fish were transferred to the P. & O. S.S. 'Nyanza' which arrived at Kuala Lumpur at the end of July. The consignment consisted of 12 cases, each case being composed of a wooden box containing a kerosene tin properly packed in shavings, which acted as a cushion and as a protection against extreme changes of temperature. These cases were described in an article entitled 'Millions and Mosquitoes' in the *West Indian Bulletin*, Vol. IX, pp. 382-90, and in Pamphlet No. 55 on the same subject.

According to newspaper accounts, this consignment of millions arrived in excellent condition, the 12 cases containing over 1,000 living fish. It would seem that with this number to serve as a start, and with the experience gained in dealing with a previous lot, a fair degree of success might be looked for in establishing millions in the Federated Malay States.

LIVE STOCK NOTES.

TUBERCULOUS POULTRY THE CAUSE OF TUBERCULOSIS IN PIGS.

The above interesting announcement is made in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (July 1913).

Fowls fed upon, or inoculated with the substance of tuberculous glands in pigs regularly developed tuberculosis, but guinea pigs similarly treated remained immune. Young pigs on being fed on the flesh of tuberculous fowls took the infection. It is thought that the disease was due to the bacilli of avian tuberculosis, and that by inoculating a living pig with fowl tuberculin, it can be determined whether the animal is suffering from the avian or mammalian form of the disease. Ten per cent. of the cases of tuberculosis in Denmark, in which country the experiments were made, are put down to the agency of the bacilli of the avian type.

PRODUCING WOOL IN THE TROPICS.

If some use for wool—for instance in the making of mattresses—could be devised locally, the efforts which are being made in tropical Africa to produce this commodity there in large quantities, should be of immediate interest and importance to West Indian stock owners.

According to the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (August 1913), in French West Africa the existence of vast pastoral districts and an increasing demand in Europe for wool, have led the Government to make organized efforts to produce a breed of animals, from which fleeces of good commercial value can be obtained. The practical possibilities of the scheme are made very strong through the existence in the French Sudan, of a race of woolled sheep, known as 'Macina' which, unlike the average sheep in the Tropics, produces wool in large quantities. The Government has issued a decree for the special improvement of this race, which are by no means uniform in type; they are, in fact, a mixture of woolled and non-woolled sheep and constant crossing tends to further mix the fleeces.

The decree issued by the Government has had some influence, but the most important line of action taken has been the establishment of a sheep farm for which Merino rams from Barbary have been imported. To show the extent to which improvement has been effected, it may be noted that the weight of a half-bred fleece is 2¾ lb., whilst the indigenous sheep give not much over 1 lb. The French Government is turning its attention particularly to methods that are being adopted in British East Africa in connexion with wool production there, namely, the continual introduction of Merino rams and ewes from Australia. Owing, however, to differences in climatic and other conditions between British East Africa and those of the Upper Senegal and the Niger, it must be only after most careful enquiry that the acclimatization of fine-wolled Merinos should be attempted.

In regard to the quality of the wool of the 'Macina' sheep, it may be added that this was so poor that it could not be dealt with by the weaving machines in Europe owing to its being nearly all coarse hair. Its price on the Niger was £20 to £24 per ton, and in Europe £60. However, as well as increasing the yield, the effect of crossing with the Barbary merinos has had a beneficial effect upon the quality of the wool also, but not to the same extent.

BACTERIA IN MILK.

In a Circular (No. 18), dealing with the sterilization of milking machines, and published by Cornell University, it is stated that the brine solution which has generally been used for the treatment of the rubber tubes and the teat cups, does not keep them in a sterile condition. In spite of the fact that the milking machine excludes external contamination, the milk may still have a high bacteria count, resulting from its coming into contact with the rubber tube. It is said that the apparatus may be kept practically sterile by the use of a salt solution containing chloride of lime, and if the machines are kept in a sterile condition, it is possible always to obtain milk with low bacteria counts.

This latter statement raises the question as to what a low bacteria count should be. An answer to it is to be found in the *Experiment Station Record* (Vol. XXIX, No. 3). In the course of some experiments to determine the various factors which influence the bacterial content of milk, a sample was carefully drawn in a sterile glass bottle by means of sterile copper dippers, and as a rule, the determinations commenced immediately, which consisted in incubating some of the diluted liquid with plain agar for seventy-two hours at 22°C.

Fifty-three samples were examined in this way, which showed an average bacterial content of 47,906 bacteria per cubic centimetre of milk. It is stated that Orr has previously suggested that clean milk, as it leaves the barn, should not contain more than 50,000 bacteria per cubic centimetre.

The extent to which milk can become contaminated bacteriologically, may be realized by referring to the *Agricultural News* (April 12, 1913), where a case is described of a sample of milk which was found to contain 26,000,000 bacteria per cubic centimetre after two days' incubation at 37°C. The seller of this substance was fined $37·50.

In continuation of the note on dwarf cattle in Nigeria, which appeared in the last issue of the *Agricultural News*, it may be of interest to point out that in *The Field* (September 6, 1913) it is suggested that these small short-horned cattle of Nigeria may be descended from an African humpless variety allied to the Celtic shorthorn, or, like the small black and white Shetland cattle, they may be a dwarf variety of a black and white Dutch breed.

It is stated in the *Queensland Agricultural Journal* for August 1913, that prickly pear has been found in Australia a particularly good food for pigs. One farmer has erected a large boiler in which the pear is stewed, and it is said that the concoction fattened a large number of animals. It is thought that pigs must take to this diet better than cows, though at the same time it is well known that cattle are very fond of the green shoots of the spineless kind of pear and devour them greedily.

The subject of cruelty to cattle is taken up by the *Port-of-Spain Gazette* (August 5, 1913) and particular mention is made of the inhuman and insanitary conditions under which animals to be slaughtered are kept previous to their time of death. It is advocated that a pasture should be provided adjoining the slaughter house. This would ensure comfort for the animals, and at the same time improve the condition of the carcase for butchers' meat. Animals brought from Venezuela are frequently received in very bad condition, and it would only seem to be in accordance with ordinary business principles to effect some improvement before the animals are slaughtered.

GLEANINGS.

In St. Vincent, experiments are being started to test the keeping qualities of arrowroot and its use for storing steel instruments.

Farmers' Bulletin No. 537 of the United States Department of Agriculture is entitled: How to Grow an Acre of Corn. This should prove useful in the West Indies.

According to *Diplomatic and Consular Reports*, No. 5130—Annual Series, high-bred cattle are imported into the Rio Grande district of Brazil from Germany.

The *Bulletin de la Association de Plante de Caoutchouc* (August 1913) calls attention to possibilities in regard to the production of oil from Hevea rubber seed.

A handbook of general information as to the Nyasaland Protectorate has just been received from the Emigrants Information Office, 34 Broadway, Westminster, London.

According to *Le Bulletin Agricole*, a new fungus disease of the sugar-cane, known as 'leaf disease', has been observed in New South Wales. It is stated to be causing very serious damage. The scientific name is not recorded.

It is stated in *Diplomatic and Consular Reports*, No. 5146—Annual Series, that the exports of coffee from Antioquia, Columbia, amounted to about 156,000 bags of 140 lb each. Most of this went to the United States.

In consequence of the dry weather experienced during the past month in Montserrat, it is considered likely that a considerable proportion of the cotton crop may be reaped as a result of second growth as was the case in 1912.

Referring to the Imperial resources for mineral oil on this side of the Atlantic, the *United Empire* (September 1913) refers to Barbados as a field which gives excellent promise. Reference is made to the recent surveys that have been made.

According to the Department of Land Records and Agriculture, Assam, the area under cotton for 1913-14 is estimated at 34,700 acres as against 34,900 acres estimated last year. The decrease is mainly due to want of timely rain. The prospects of the crop are at present fair.

Some damage has been occasioned in Nevis to cotton by the leaf-blister mite. This is believed to be due to an insufficient interval having been allowed to elapse between the destruction of the old, and the planting of the new crop. Dry weather has no doubt also been an encouragement.

The total area under bananas in Costa Rica at the end of 1912 was about 94,200 acres, and new plantations amounting to about 7,500 acres were made during the year. The export of bananas during 1912 was 10,647,702 bunches, an increase of 14·37 per cent. on the export of the previous year.

The *Louisiana Planter* for July 19, 1913, calls attention to the possibility of central sugar factories co-operating with municipal authorities for supplying towns with light and power and, perhaps, with water. If this could be carried into effect it is believed it would reduce the cost of sugar manufacture.

Up to August 1913, several thousand patents had been taken out in the United States on sugar-making machinery, processes, etc. There are in the Patent Office, forty-three divisions or bureaus, each devoted to one definite subject or 'group of subjects, and each division is in charge of an examiner' and several assistant examiners. (*American Sugar Industry*, August 1913.)

In the fourteenth century, when the African historian Ibn Batuta made his journey across the desert from Morocco to the Niger, he found that it was the custom for the people to store water in trees—a practice still common in Kordofan to this day. The tree chiefly used for this purpose is the Baobab tree, *Adansonia digitata*. (The *Geographical Journal*, September 1913.)

The General Cultivation Committee for coco-nuts appointed by the Agricultural Society of Trinidad and Tobago, are of opinion that the crime of praedial larceny will never receive any appreciable check in the colony unless the penalties for the crime include the infliction of corporal punishment. (*Proceedings of the Agricultural Society of Trinidad and Tobago* for August 1913).

In Nyasaland the question of improved transport facilities continues to receive discussion. As regards cotton in Uganda, it is stated that the ginnery buildings and the equipment supplied by the Association to the British East Africa Corporation have been erected in the remarkably short period of six months. It is anticipated that the cotton crop in Uganda this year will amount to 30,000 bales, and it is hoped that next season's crop will exceed 40,000 bales.

According to the Report of the Commissioner, Southern Grenadines, for the year 1912-13, published in the St. Vincent *Government Gazette* for September 4, 1913, the exports of cotton amounted to 117 bales of Marie Galante and 9 bales of Sea Island, of the total value, £1,150. This is an increase of 36 bales as compared with the year 1911-12. Reforestation efforts continue to make satisfactory progress. Much use is being made of the West Indian ebony tree (*Albizzia Lebbek*).

STUDENTS' CORNER.

OCTOBER.

Second Period.

Seasonal Notes.

INFORMATION ON AGRICULTURAL PROGRESS AND RESEARCH DURING THE CURRENT YEAR.

In the last issue of the *Agricultural News* candidates were advised, in view of the forthcoming examinations, to run through the past numbers of this journal for the current year. This advice applies more particularly to the Intermediate and Final candidates. Discretion will be exercised by these candidates in regard to paying particular attention to those articles dealing with the special crop subjects which they propose to take in the examination. Intermediate candidates will be careful to pay attention to practical information given under the headings of Insect and Fungus Notes.

It may be of assistance to give a select list of articles which have appeared in the current volume of the *Agricultural News*, that should receive particular attention; these are as follows:—

The Budding of the Mango in St. Lucia, p. 4; West Indian Cotton Growing Season 1911-12, p. 6; Black Witch or Tick Bird, p. 10; Prevention of Cross Pollination in Cotton Experiments, p. 14; Calcium and Magnesium in the Soil, p. 21; Boll Shedding of Cotton, p. 23; Summary of Entomological Information, p. 26; A Disease of Tanias, p. 30; Sugar-cane Experiments in Antigua, 1911-12, p. 35; Budding Cacao in Dominica, p. 36; Summary of Entomological Information, 1912, p. 42; Note on Insect Pests in the Virgin Islands, p. 42; Artificial Ripening of Bitter Fruits, p. 53; A New Method of Soil Analysis, p. 57; Insect Pests in Barbados, p. 58; Carbon Assimilation, p. 62; Confusion in the Names of Certain Fruits, p. 68; Recent Publications on Soil Fertility, p. 71; Miscellaneous Entomogenous Fungi, p. 78; Use of Germicides in Sugar Factories, p. 83; Parasites of the Cotton Worm, p. 86; Nature of Cacao Fermentation, p. 91; Report on the Agricultural Bank, St. Vincent, p. 91; Prize Pasture Competition at Antigua, p. 99; New Stock for Oranges, p. 100; Antigua Agricultural Exhibition, p. 107; Improvement of West Indian Pastures, p. 113; Vanilla Cultivation at St. Vincent, p. 116; Osmosis in Soils, p. 120; Soil Sickness and Partial Sterilization, p. 123; Animal Nutrition, p. 123; Subsoil Water, pp. 133 and 155; Micro-organic Population of the Soil, p. 134; St. Kitts Agricultural Show, p. 135; Explosives in Agriculture, p. 136; Effect of Drainage on Rice Soils, p. 137; The Verdict of the Animal, p. 141; Uniformity in Cotton Production, p. 145; Multiple Mills, p. 147; Damage to Sugar-cane by Fire, p. 147; A Reversible Barrel, pp. 147 and 311; Treatment of Storm-damaged Cacao Trees, p. 148; Heredity and Mutation, p. 150; Lime Cultivation in St. Lucia, p. 151; Presence of Formaldehyde in the Sap of Green Plants, p. 152; Red Rot Fungus and the Sugar-cane in the West Indies, p. 159; Feeding Value of Bengal Beans, p. 164; Zapupe Fibre, p. 166; Feeding Value of Cacao Husks, p. 169; A Disease of Sisal Hemp, p. 174; Manufacture of Syrup, p. 179; Economic Value of the West Indian Gru-gru Palm, p. 180; Cotton in the St. Vincent Grenadines, p. 182; Problems in Propagation by Cuttings, pp. 183 and 197; Organic Soil Constituents, p. 184; Bovine Tuberculosis in the West Indies, p. 187; Root Borers and Other Grubs in West Indian Soils, p. 186; Sugar-cane Experiments in the Leeward Islands, 1911-12, p. 195; Superiority of Tin Cans over Pots for Seedling Plants, p. 200; Dissemination of Insects in Shipments of Sugar-cane, p. 202; Panama Disease of Bananas, p. 206; Effect of Partial Sterilization of Soil, p. 207; Indian Corn as a Crop in the West Indies, p 209; Cost of Spraying Cacao in Trinidad, p. 212; Kiln Drying of Grain, p. 213; Germination of Tobacco Seed, p. 214; Sugar-cane Tops for Ensilage, p. 227; Practical Flooring for Pig Styes, p. 230; Corn Ear Worm on Rice, and the Control of Froghoppers, p. 234; Ventilation in Fruit Storage, p. 235; Disease of the Castor Plant, p. 238; Motor Cultivation, p. 241; Satisfactory Way of Shipping Bananas, p. 244; Disinfectants and Disinfection, p 247; Mutation in Micro-organisms, p. 249; Pests in Antigua, p. 250; Control of the Milk Supply in Small Communities, p. 257; Effect of Common Salt on Growth of Sugar-cane, p. 259; Composition of Soils Suitable for Rubber Cultivation, p. 259; Cohune Nuts from British Honduras, p. 260; Sugar-cane Pests in British Guiana and Cacao Thrips in Florida, p. 266; Cyanamide as an Insecticide, p. 271; Sampling Cane for Analysis, p. 275; Composition of Tropical Fruits, p. 276; Action of Bay Oil on Lead, p. 278; Fermentation of Cacao by Mechanical Means, p. 292; Danish Tuberculin Unions, p. 293; Sakellarides versus Sea Island Cotton, p. 284; Use of Flour Paste in Spraying, 298; Pollination and Cross-fertilization of Rice, p. 301; Witch Broom Disease of Cacao, p. 302; Agricultural Co-operation, p. 307; Soil Investigations, p. 310; Mechanical Preparation of Coir Fibre, p. 311; Growing Tobacco for Insecticide Purposes, p. 313; A Disease of Rice, p 318; Sterilization of Seed, p. 318.

It may be pointed out that it is not suggested that the candidate should attempt to read through the above articles word for word, nor should the impression be received that anything in the nature of 'cramming' is entertained: the aim in presenting the above list is that the student should grasp the central ideas involved in each article, in order that his practical experience of the matters dealt with may be supplemented by recent facts of a scientific or general nature.

Schools for the Study of Rubber.—A letter which appears in the *India Rubber World* (September 1, 1913) gives an interesting account of the work done at the school of rubber at the Northern Polytechnic Institute, London. This establishment provides instruction for those intending to enter the rubber manufacturing industries and also for intending emigrants who desire to become plantation assistants on any of the Eastern estates. Hitherto most of this latter class has gone out without any scientific knowledge of rubber and its production.

Amongst the students taking the day course at the school are the sons of rubber manufacturers who are intended to take a place in a factory or laboratory; foremen wishing to widen their knowledge on the scientific side; also persons preparing for plantation appointments or as assistant chemists. The evening students, who are by far the most numerous, are composed almost entirely of men actively engaged in some branch of the rubber industry in London.

Two abstracts in the *Experiment Station Record* (June 1913) give information concerning new rubber trees. In West Africa two distinct forms of *Hevea brasiliensis* have been found to exist, which show a variation in the production of latex. The second abstract deals with a new rubber plant discovered in Mexico. It belongs to the genus Plumeria, of the family Apocynaceae, and yields latex containing about 25·5 per cent. of rubber and 21·9 per cent. of resin.

FUNGUS NOTES.

RECENT JAPANESE WORK ON ENTOMOGENOUS FUNGI.

A paper by Kingo Miyabe and Kaneyoshi Sawada, published in the *Journal of the College of Agriculture* (March 1913) of Tohoku Imperial University, deals with the following seven species of fungi found parasitic on scale insects in Formosa: *Aschersonia Aleyrodes*, Webber; *A. Marginata*, Ell. et Ev.; *A. Suzukii* sp. n.; *Sphaerostilbe coccophila*, Tul.; *Microcera Fujikuroi* sp. n., *Ophionectria coccicola*, (Ell. et Ev.) Berl. et. Vogl.; and *O. tetraspora* sp. n.

Of the above, *S. coccophila* (red-headed fungus) and *O. coccicola* (white-headed fungus) are well known in the West Indies. A species of Aschersonia (*A. turbinata*) also occurs in the West Indies on the mango shield scale (*Coccus mangiferae*). *A. Aleyrodes* is reported to occur on white fly in Cuba, most probably having been imported there from Florida, where it is a very common entomogenous parasite. Yet a third species, *A. tahitensis*, has been reported from certain localities in the West Indies, among them from Jamaica.

To return to Miyabe and Kaneyoshi's paper, *Aschersonia Aleyrodes* occurs in Formosa as a parasite on *Parlatoria ziziphi* (Lucas) Sign., infesting the leaf of *Citrus nobilis*, Lour. (Mandarin orange). *A. marginata* lives on *Coccus longulus*, Dougl., and *Parlatoria ziziphi* (Lucas) Sign. infesting the leaf of *Citrus nobilis*, Lour., and *Psidium guyava*, L. Its distribution is stated to be the Sandwich Islands and Japan.

A. Suzukii M. et S. sp. n., is parasitic on the long shield (*Coccus longulus*, Dougl.) infesting the living leaves and branches of *Citrus nobilis* and *Fagara nitida*, Roxb. This fungus is closely related to *A. Eugeniae*, but the authors regard it as a distinct species. Points of difference between the two forms are given in the paper. It is widely distributed in Japan, and is an effective parasite on scales attacking orange trees.

Sphaerostilbe coccophila is stated to be the most common entomogenous fungus on scale insects found in Japan. It is extremely rare to find it in its ascosporous stage in Formosa, as well as in other parts of Japan. In only one instance were perithecia met with, that is, on scale insects infesting the tea plant.

The next fungus dealt with is *Microcera Fujikuroi*, M. et M. sp. n. The most remarkable character of this fungus is stated to be its effect on the host, changing the projecting central portion of the scale into a brilliant scarlet colour, which is especially intense in the middle, fading gradually towards the periphery. The species is commonly found throughout the island of Formosa, often associated with *Microcera coccophila*, Desm., from which it can be easily distinguished. The new species is said to resemble closely some of the Ceylon forms described by Parkin.

The white-headed fungus (*Ophionectria coccicola*) occurs widely in Japan—but is not so prevalent as the red-headed fungus— on the following scale insects: *Parlatoria ziziphi*, red-spotted, or Florida red scale (*Aspidiotus ficus* Comst.,), *Mytilaspis gloveri* (Pack) Comst., and the purple scale (*Mytilaspis citricola* [Park.] Comst.) infesting *Citrus nobilis*. Both conidial and ascosporous stages are found. The writers' spore measurements differed somewhat from those of Ellis and Everhart.

The fungus dealt with last of all is *Ophionectria tetraspora*, M. et. S., sp. n. This is parasitic in Formosa on *Parlatoria ziziphi*, infesting *Citrus nobilis*. The distinguishing characteristic of *O. tetraspora* is the production of four conidia on the apical cell of the conidiophore, although there are occasionally cases with three or five. This species, although not so common as *O. coccicola*, is still frequently found on the scale insects infesting orange trees in Formosa.

CONTAMINATION OF SOIL BY THE TOXIC PRODUCTS OF PARASITIC FUNGI.

The hypothesis that fungi—particularly those parasites causing root diseases—exert a harmful influence on the roots of cultivated plants owing to the exertion of poisonous products, has of late been put forward on several occasions in the *Agricultural News*. This hypothesis has been, to some extent, verified by experiments conducted in Italy.

According to the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (April 1913), it appears that soil, especially if it contains clay, can be impregnated with toxic products arising from the decomposition of vegetable organs infected by fungus parasites.

To avoid the objection that the toxic matter might have been derived from the cells of the host plant, the effect of concoctions of the fungi (*Sclerotinia Liberitana*) and *Fusarium incarnatum* was studied in connexion with lucerne and the germination of red clover seed. Neutralized unboiled culture liquid of *S. Libertiana* caused the death of an entire lucerne plant in one night; when the liquid was heated to 100°C, the same effect was produced in two or three days. Culture liquid of a fresh growth of *F. incarnatum* hindered the germination of clover seed, but particularly the young roots in the surface soil.

In general it was concluded that, under field conditions, toxic substances can diffuse in the soil to neighbouring plants and hinder the growth of roots, or prevent the germination of seed.

It would seem that the above results might possess some significance in regard to root diseases of lime trees in the West Indies.

Varieties of Sugar-cane in Tucuman, Argentina.—In the five years between 1908 and 1912, eighty-two varieties of sugar-cane were tested at the above station. The varieties Roxa 15, Tamarin 21, Bois rouge 26, Cayana 48, Verde de las Antillas 50, Sin nombre 52, Sin nombre 58, Sin nombre 65, Riscada de Santa Barbara 74, and 76 Java 234 were distinguished for their sugar content; Cayana Roxa, Verde de las Antillas 50, Sin nombre 52 and 58 and 76 Java 234 for their resistance to *Bacillus sacchari* (polvillo), though no completely resistant variety exists; the same varieties with the exception of Sin nombre 52, for their relative resistance to the attacks of *Diatraea saccharalis* (perforador); the varieties Roxa 15, Tamarin 21, Bois rouge 26, Sin nombre 52 and 58, Riscada de Santa Barbara 74, and 76 Java 234 for their resistance to sudden falls of temperature, which in Tucuman constitute the chief risk in sugar-cane growing.

On the whole, 76 Java 234 is, of all the varieties tested, the one most to be recommended. In three analyses of this cane the percentage of saccharose ranged between 11·75 and 15, the purity between 83·33 and 89·82, and the industrial value from 9·79 to 13·47. (From the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, May 1913.)

SOIL INVESTIGATIONS.

SULPHUR IN RELATION TO THE MANURING OF RICE.

The experiments on which the following information is based were conducted by Alice Thompson at the Experiment Station, Hawaii, and the results abstracted in the *Experiment Station Record*, Vol. XXIX, No. 3.

One of the objects of the work was to determine the effect, if any, of fertilizers on the sulphur and chlorine composition of the plants grown under natural soil conditions, also to determine the amounts of sulphur and chlorine contained in the rice field soil and water.

The rice plants experimented on were analysed during three stages of growth. At the first harvest the effect of ammonium sulphate, superphosphate and potassium sulphate was tried. It was found that the plants of the unfertilized plot (control) showed about 0·1 per cent. more sulphur than the fertilized plot. The percentage of mineral sulphur was found to be almost four times as high in the roots of the plants as in the foliage. At the second harvest there was practically no difference in the composition of the plants, although the fertilized plants were much larger and heavier. At the third harvest the fertilizers showed no effect on the composition of the plant.

RICE ABSORBS SULPHUR IN AN ORGANIC FORM.

The possibility of sulphur fertilization being required by a plant that absorbs about half as much sulphur as it does phosphoric acid is pointed out. The problem is a difficult one, however, since it was proved that under natural conditions, the rice plant obtains its sulphur in an organic form only. An analysis of a rice field soil indicated that the sulphur in the soil is present largely in an organic form, since the acid-soluble and water-soluble sulphur are relatively so small.

An increase in the total sulphur in the case of pot cultures, particularly when ammonium sulphate was added, seemed to indicate that under these conditions, mineral sulphur is undoubtedly absorbed and utilized by the plant.

COMPOSITION OF SOIL IN THE VIRGIN ISLANDS.

Samples of soil from two parts of the Botanic Station at Tortola have been analysed in Antigua by Mr. H. A. Tempany, B.Sc., F.I.C., Superintendent of Agriculture for the Leeward Islands. As regards the physical analyses, both these soils show a fairly high percentage of fine silt (about 38 per cent.); one sample contained 14·4 per cent. of stones. The soils are light and easily worked, but at the same time are supplied with a moderate sufficiency of clay constituents; both samples drained freely. Sample A was well supplied with nitrogen (0·179 per cent.) and with organic carbon (1·335 per cent.); in the case of sample B, the amount of nitrogen was somewhat low (0·139 per cent.), and in view of the fact that the percentage of organic carbon is 1·090, it is likely that a good dressing of organic manure might be of benefit. The soils contain 0·029 and 0·087 per cent. respectively of lime. They are therefore deficient in this substance, and a moderate dressing of the mineral would therefore appear to be advisable.

METHOD OF ESTIMATING CALCIUM CARBONATE IN THE SOIL.

No excuse is needed for presenting the following account of how the percentage of calcium carbonate in the soil can be determined easily and quickly without the employment of any elaborate apparatus. The determination of calcium carbonate (or its equivalent in lime) is one of great practical importance to the planter, and although the determination is chemically simple, most of the gravimetric or weighing methods commonly employed to do it are either inaccurate or else lengthy and complicated.

Ten grammes of finely divided air-dried soil are placed in a dry wide-mouthed flask or bottle, and 100 c.c. of roughly quarter-normal acetic acid are added.

During ten minutes the flask is shaken with a rotary movement every time the bulk of the soil settles, which occurs approximately every thirty seconds.

The soil is then allowed to settle for the last time, and the liquid contents of the flask decanted through a dry filter. Schleicher & Schull's filter hats answer the purpose admirably.

A control experiment is made with another 10 grammes of soil, using distilled water as the extracting solvent.

Twenty-five cubic centimetres of each filtrate is evaporated to dryness in a platinum dish and ignited at a bright red heat for thirty minutes.

The residues when cool are treated with 10 c.c. of deci-normal acetic acid (or more if necessary).

Solution is effected in a few minutes, particularly if the residues are gently rubbed with a glass rod tipped with a small rubber bung.

The excess of acid is then titrated with deci-normal soda or potash and phenolphthalein used as indicator.

The volume obtained from the control is now subtracted from that obtained from the acid extraction of the soil and the result multiplied by 0·2. The product gives the percentage of calcium carbonate in the soil.

The process described above is taken from an article in the *West Indian Bulletin*, Vol. XIII, No. 3, by H. S. Shrewsbury, F.I.C., Assistant Government Analyst, Trinidad.

In the *Journal of the Royal Agricultural Society of England*, Vol. LXXIII, pp. 1-9, appears an article on the value of soil analyses to the farmer, by A. D. Hall, F.R.S. In the summary to this account the writer puts forward the following benefits which accrue from analyses: (1) mechanical analysis enables us to classify soils and assign an unknown example to its type; (2) from the type, combined with knowledge of the situation and climate, we may predict its suitability or otherwise for particular crops; (3) chemical analysis will tell us whether a soil is getting acid or needs liming to make it work properly and utilize the manure supplied to it; (4) from chemical analysis we can settle what class of manures ought to be used—whether sulphate of ammonia or nitrate of soda, superphosphate or basic slag; (5) chemical analysis will often reveal particular deficiencies and the specific need for phosphates or potash, but to do this with any certainty, the composition and behaviour of soils of that type should be known from a previous soil survey.

MARKET REPORTS.

London.—The West India Committee Circular, September 23, 1913; Messrs. E. A. de Pass & Co., September 12, 1913.

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Trinidad,—Messrs. Gordon, Grant & Co., September 29, 1913.

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Rice—Yellow, $5·35 to $5·40; White, $4·90 to $4·95 per bag.
Sugar—American crushed, no quotations.

Barbados,—Messrs. James A. Lynch & Co., Ltd., October 4, 1913; Messrs. T. S. Garraway & Co., September 27, 1913.

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Sugar—American granulated, $4·00 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, September 27, 1913; Messrs. Sandbach, Parker & Co., September 26, 1913.

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The Supply of Corn for the West Indies.

By far the most important crop in the world, from the point of view of yield, is the potato crop, of which the annual production is about 156 millions of tons. Coming below this prodigious figure it may be noted, is the world's annual yield of sugar-cane, which amounts to something like 80 millions of tons. The world's production of Indian corn, however, approaches much nearer to that of potatoes, whilst it considerably exceeds the output of wheat. It is approximately 133 millions of tons. Of this enormous quantity of grain, North America produces 78 per cent., Europe 15 per cent., leaving only 7 per cent. for the other continents which, it is significant to observe, are to a large extent situated in the Tropics. Exactly what part of the 7 per cent. the West Indies are responsible for, it is difficult, practically impossible, to say; for, such small areas as are put under this crop we find cultivated principally as a catch-crop for immediate estate consumption.

The part taken by the West Indies is at any rate infinitesimally small, and quite inadequate to meet the local demand which is principally supplied, as is well known, by the United States.

In the near future it is at least clearly evident that better and more intensive methods will have to be employed in the West Indies, and probably there will have to be an extension of area, for—to return to the statistics—although North America produces 78 per cent. of the world's crop, and supplies 26 per cent. of the amount needed by foreign countries—including the West Indies—that must buy, it is only just over 2 per cent. of the United States' prodigious production that is exported, and this has fallen in five years to its present low position from over 9 per cent. Such a decrease in exportation indicates that home consumption in the United States will soon equal production. In fact, during the past three years corn has been imported on the Pacific coast. The consumer's increased demand will raise the prices, and it may be predicted that the West Indies will not be likely to escape from the effects of it unless they make the necessary provisions to meet it.

Reference has just been made to foreign countries —including the West Indies—which must buy. But the statement is too general. The West Indies have no occasion to buy to the extent they do, provided the cultivation of corn be conducted on a more intensive and extensive scale under co-operative conditions. Those interested in the matter—and there are a large number—will remember possibly, a previous editorial on this subject. It may be recollected that great importance was attached in that article to the introduction of co-operative methods for the collection, drying and storage of the grain. It is, it seems, the depreciation of stored grain in the Tropics which tends to check the extension of the area under Indian corn, and strangely enough, in America itself, where as a general rule only grain for export is passed through the hot air driers, the Department of Agriculture is now considering what methods shall be adopted in the case of corn produced for immediate or early consumption on farms, in order to check the damage occasioned, particularly under unfavourable climatic conditions, by weevils and mildew. Apart from the initial loss—which is very great—occasioned by these organisms, there is also strong evidence which indicates that diseased corn and corn fodder tend to induce a disease known as cerebral meningitis of horses. There is a likelihood, then, that the cost of producing corn will tend to rise in America, and this together with an increased demand, is likely to render it necessary for the West Indies either to do without the grain or else produce it themselves on sound economic lines.

Quite recently the Government of the Leeward Islands has given the matter detailed attention as the outcome of the previous editorial in this journal, and in a recent paper on the subject read by His Excellency the Governor before the Antigua Agricultural Society, it was suggested that an experiment should be conducted with a central kiln drier on commercial lines, the necessary funds to be obtained by co-operative donations and, if necessary, with the assistance of the Government. The chief questions which the proposed experiment would be intended to settle would be, first, whether locally grown corn can be properly kiln-dried in these islands; secondly, whether the grain so treated is equal in quality to the grain now imported; thirdly, whether it will keep as well; and, lastly, whether it will sell as well.

There can be no doubt that the first three questions can be answered in the affirmative. There has, however, been some hesitation shown in regard to the last, and that will be the main object of the proposed investigation. From an external economic point of view, it is believed that the information given in this article, although treating of only one side of the subject, is encouraging, and lends considerable support to the idea that conditions of production and consumption in America are favourable in respect of an increased production of grain in the West Indies, and, in a general way, looking into the future, the view may be expressed that with proper co-operation, it will be found cheaper in a few years' time for a merchant to buy from a central kiln-drying plant established locally in certain islands like Antigua and Barbados, than from the United States of America or even from the world's greatest corn exporting country—the Argentina.

SUGAR INDUSTRY.

SUGAR-CANE EXPERIMENTS AT ANTIGUA.

At the meeting of the Antigua Agricultural and Commercial Society held on Friday, October 1, Mr. H. A. Tempany, B.Sc., Superintendent of Agriculture for the Leeward Islands, laid before the members a summary of the results obtained in the recently concluded experiments with varieties of sugar-cane.

The trials were conducted on plants and first ratoons on the fields of estates in different parts of the island, the treatment received by the plots being essentially similar to that of previous years, and to that received by the ordinary canes of the estate. The canes were planted in rows traversing the field. In all, forty-two varieties were under experiment, the list of canes grown being closely similar to that of the previous season.

The following tables indicate the mean yields:—

PLANT CANES.

Means for each variety grown in 1912-13.

Name.	No. of plots grown.	Pounds per acre in juice.
1. B.4596	8	5,410
2. B.3922	8	5,140
3. Sealy Seedling	7	4,480
4. B.254	7	4,450
5. B.6450	8	4,240
6. B.109	7	4,050
7. White Transparent	7	3,980
8. B.1528	8	3,910
9. D.1111	8	3,720
10. B.147	7	3,720
11. B.1355	8	3,710
12. D.74	8	3,600
13. B.393	7	3,560
14. B.208	7	3,530
15. B.376	7	3,510
16. B.3696	8	3,510
17. B.3675	8	3,510
18. D.848	8	3,500
19. D.109	7	3,450
20. D.625	8	3,450

PLANT CANES.

Means for each variety grown during the past six years.

	Name.	No. of plots grown.	Pounds per acre sucrose, in juice.	No of seasons.
1.	B.4596	46	6,000	5
2.	B.3922	17	5,610	2
3.	Sealy Seedling	40	5,590	6
4.	D.625	41	5,040	6
5	B.1528	46	4,820	6
6.	B.156	39	4,810	6
7.	B.254	15	4,740	2
8.	B 208	40	4,710	6
9.	B.1355	36	4,680	6
10.	D.109	40	4,620	6
11.	D.1111	45	4,620	6
12.	D.3696	44	4,590	6
13.	B.6450	25	4,590	3
14.	B.109	38	4,550	6
15.	B.376	38	4,520	6
16.	B.1753	48	4,500	6
17.	B.306	39	4,490	6
18.	White Transparent	39	4,450	6
19.	B.393	41	4,380	6
20.	B.147	36	4,720	6

B.4596 has continued to show the very favourable results experienced in former years and is strongly recommended as a cane suitable to Antigua conditions.

Sealy Seedling has also maintained its position very satisfactorily. B.3922, a recently introduced cane, has taken a high position in the table and appears to show great promise, while B.254 and B.6450 have also given favourable results; the latter cane has also attained a considerable reputation in Barbados.

The mean returns given by the best canes cultivated as ratoons are given below.

RATOON CANES.

Means for each variety grown in 1912-13.

	Name.	No. of plots grown.	Sucrose, lb. per acre, in juice.
1.	B.3922	9	3,150
2.	B.156	8	2,860
3.	B.4596	9	2,850
4.	Sealy Seedling	8	2,670
5.	B.3747	9	2,560
6.	B.254	8	2,510
7.	B 109	8	2,490
8.	B.1528	7	2,390
9	B.6450	9	2,300
10.	B.147	8	2,280
11.	B.3696	8	2,270
12.	D.95	7	2,150
13.	B.376	8	2,140
14.	D.625	6	2,100
15.	A.95	7	2,090
16.	B.208	8	2,040
17.	B 6346	8	2,040
18.	B.306	8	2,000
19.	B.393	7	1,970
20.	D.116	8	1,910

In the results for the past year, the lead is taken by B. 3922 followed by B. 156 and B. 4596 while in the means for all seasons, B.4596 easily maintains its supremacy, further enhancing the favourable opinion held concerning it.

The weather during the growing season was, on the whole, again decidedly unfavourable, and yields in consequence have continued below both those from plant canes and first ratoons.

RATOON CANES.

Means for each variety grown during the past five years.

	Name.	No. of plots grown.	Pounds per acre sucrose, in juice.	No. of seasons.
1.	B.4596	32	3,350	5
2.	B 3922	10	3,200	2
3.	B.1528	33	3,110	5
4.	B.156	31	3,110	5
5.	Sealy Seedling	28	2,990	5
6.	B.306	28	2,960	5
7.	B.376	29	2,950	5
8.	B.109	30	2,930	5
9.	D.109	25	2,910	5
10.	B.3696	31	2,840	5
11.	B.147	22	2,750	5
12.	B.208	29	2,680	5
13.	D.95	30	2,640	5
14.	B.6450	14	2,620	3
15.	B.254	9	2,600	2
16.	D.625	28	2,580	5
17.	B.1753	32	2,540	5
18.	B.3747	10	2,530	2
19	D.2190	21	2,520	4
20.	D.116	30	2,610	5

In concluding his address Mr. Tempany acknowledged the assistance and co-operation rendered by planters in carrying the experiments to a successful conclusion.

SYRUP MAKING.

The subject of syrup manufacture receives attention in several articles appearing in a recent issue of the *Louisiana Planter* (September 27, 1913), one dissertation on the subject of recent origin, being an account by Professor Taggert concerning this particular branch of the sugar industry in connexion with conditions obtaining in Louisiana. It is pointed out in this article that with free sugar in sight, planters will have to produce a marketable sugar on the plantations or else manufacture table syrup. A description is then given of various details connected with the manufacture of syrup, and the necessity for co-operation amongst the smaller planters is pointed out

From a technical aspect, perhaps the most interesting remarks offered by Professor Taggert are those concerning what may be called the selling properties of syrup. His observations on this subject are as follows:—

'The market demands that syrup shall have body, colour and flavour. By body is meant density, and whereas a buyer on the exchange with his years of experience can judge this point by pouring a few drops on a piece of paper, that method is as risky for the amateur as the described ladle method. Accuracy can be attained only by using a spindle. Colour is a requirement which often influences the price paid for syrup as much as 8 or 10c. While colour does not influence the taste or value as food of the product, the consumer wants an amber colour with a slight green tint. A little opalescence does not depreciate the selling quality, but the slightest red or reddish-yellow will bring down the selling price to a minimum. This last requirement, together with flavour, cannot be had successfully without proper clarification. Clarification is without doubt the most important factor influencing the quality of syrup, and good clarification can only be produced by the use of sulphur and lime.'

FRUIT AND FRUIT TREES.

LIME CULTIVATION.

The last of the series of articles on the cultivation of limes in Dominica has appeared in *L'Agriculture Pratique des Pays Chauds* (June 1913). At the end of the concluding article it is stated that Martinique and Guadeloupe ought to extend their area under lime cultivation; for, in view of the fact that Dominica has surmounted by experience and experiment such difficulties as exist in the West Indies, the extension referred to would not incur any great risk, provided Dominica practices were carefully followed. Reference is also made to L'Association Citroniere du Gosier, established in 1909 in Guadeloupe for the production of concentrated lime juice. This society has also founded a central factory. A start has therefore been made in regard to lime products.

In discussing the production of lime products it is interesting to note in *Diplomatic and Consular Reports* No. 5106—Annual Series, that the world's production of citrate of lime and concentrated lime juice amounts to an average of about 7,200 metric tons per annum of which about five-sixths are produced in Sicily. The remaining 1,000 tons are produced in the British Antilles (principally in the islands of Dominica and Montserrat), in Mexico, and in Central and South America.

The marketing of the lime products just referred to is naturally conducted on a more mechanical basis than the selling of fresh limes. The recent tendency to export fresh limes from Dominica in a poor and ungraded condition has to some extent been satisfactorily checked through the appointment of an American trade representative at Roseau. According to the *Dominica Guardian* (September 27, 1913), similar action will be taken shortly by the Jamaica Government, who contemplate the appointment of competent persons as fruit inspectors to see that no immature oranges or other citrus fruits in an undesirable condition are exported from that island. The paper referred to above is of opinion that the authorities in Dominica might find it desirable to follow Jamaica's example.

Those interested in lime cultivation should obtain a copy of a recently published pamphlet by the Imperial Department of Agriculture, entitled Lime Cultivation in the West Indies. This publication deals with every branch of the industry, and is well illustrated. It has been favourably reviewed from several sources.

Arsenic on Fruit.—A report has recently gained circulation in Christiana that a well-known Norwegian food bacteriologist has warned the public against the possibility of arsenical poisoning from eating apples. Certain apples imported from North America were, on examination, found to have a visable layer of green powder in the hollow near the stalk. This was found to contain copper and arsenic. The presence of these substances is believed to be due to spraying with Bordeaux solution and Paris green after the fruit had begun to set. It would appear that growers should take care to prevent the recurrence of this dangerous condition.

This reference to copper calls to mind a recent statement that the metal occurs in cocoa and chocolate. According to the *Experiment Station Record*, it appears that, on the basis of analytical data, copper does not occur in any considerable quantity in these substances.

VARIETIES OF BANANAS CULTIVATED IN THE SEYCHELLES.

An interesting account of varieties of plantains and bananas cultivated in the Seychelles appears in the *Kew Bulletin of Miscellaneous Information*, No. 6 of 1913. From this paper the following notes have been abstracted.

The first variety mentioned is the Chinese banana (*Musa Cavendishii*) called locally 'Banane gobule', and is eaten raw. It is said to be open to attack by the weevil (*Sphenophorus striatus*). The Chinese banana is the only dwarf type planted in the Seychelles. Among the tall plantains there are several varieties which are eaten raw in the ripe state, although most of them are eaten cooked before they are properly matured. The three following varieties are never eaten raw, and when prepared in coco-nut milk, are considered a delicacy even by Europeans and other residents: Banane Malgache, Banane St. Jacques, and Banane Simeroë. These three varieties belong to the Congo type, and two of them were cultivated a short time ago for the production of banana flour.

Amongst those varieties generally eaten raw may be mentioned Banane 'Mille', a tall plantain of the Malay type, the fruit of which keep well. The Banane 'Mignonne' is observed to be a delicious small banana introduced from Réunion island. The plant is tall and the pseudo-stem is brown. The fingers are small but the flesh is hard and highly flavoured. Other popular varieties for table purposes are the Banane 'Tahiti', Banane 'Gingeli' (rather susceptible to weevil), Banane 'Carré' the fruit of which possesses four pronounced ridges—hence its name. They are generally eaten cooked, but produce a good yellow-coloured starch on being dried. A very hardy plantain is the Banane 'Quatre-vingt'. Banane 'rouge' has a remarkable red colour and since the fruit is good, the tree is both useful and ornamental. A good variety for withstanding the cool climates of high summits is said to be Banane 'Blanche'.

Effect of Fertilizers on the Quality of Citrus Fruits.—In connexion with a review of his article on the effect of manures on the quality of citrus fruits, which appeared in the *Agricultural News* (September 13, 1913), Mr. Cunliffe writes to say that he personally conducted the test under the auspices of the German Kali Works while stationed at their Havana Depôt. He suggests that in reviewing his results we seemed to regard the demonstration of new facts the object of his investigation, whereas the main object was actually to determine how far the results obtained in other districts were applicable under the varying and somewhat unique conditions existing in Cuba. Furthermore, in response to some remarks which appeared in the review in regard to mulching, Mr. Cunliffe is of opinion it was not intended to convey in his paper that mulching in its various forms was not an excellent practice, but merely to indicate that it might not be all that it appeared to be, particularly under Cuban conditions.

A letter has recently been received at this Office from Mr. A. Simpson, Director of Agriculture, Uganda Protectorate, in which he refers to the rapid progress which is being made in that country in connexion with native cotton cultivation, and to some extent with cacao, sugar and Para rubber. From the *Official Gazette* of the Uganda Protectorate (August 15, 1913), it is seen that the total value of the cotton exported during April-June 1913 was £101,502 compared with a value, for 1912, of £84,363.

LIVE STOCK NOTES.

DAIRYING IN JAMAICA.

There exists at present in Jamaica land at the rate of 2½ acres per head of population, which is in bush and not productive. This circumstance, together with the fact that the population consumes per head the equivalent of 3½ quarts of cow's milk in the form of the imported tinned article, has prompted the Director of the Jamaica Department of Agriculture (Mr. H. H. Cousins, M.A., F.C.S.) to publish in the Bulletin of the Department (Vol. II, No. 7) the interesting and important article under consideration.

Before proceeding to abstract the essential points put forward in this account, it may be further explained in regard to the objects of the article, that Mr. Cousins draws attention to a third circumstance in support of the necessity for the improvement of dairy cows and increased milk production in Jamaica, namely, that one of the chief causes of infantile mortality is the improper feeding of children, owing to the difficulty of obtaining pure milk in sufficient quantity.

As a class, the native milk cattle in Jamaica are not adapted to milk production; they have in the past been developed almost entirely for purposes of beef, on the one hand, or draft on the other. Even when, as occasionally does occur, a calf is born with a marked capacity for giving a good flow of milk, such an animal generally turns out to be so wild that she can only be milked when thrown on the ground. It is interesting to note that a typical record for lactation of a native milch animal was the production of of 1,107 quarts (2,978 ℔.) of milk in ten months, with a maximum of 5·2 quarts when fresh, and a daily average of 3·7 quarts.

JERSEY BREED UNIFORMLY SUCCESSFUL.

With a view to improving the general standard of dairy cows, a number of superior animals have been imported during the past fifteen years from the United States, Canada and Barbados. Ten years ago the Holstein breed was in great favour, but it has been found that the blood of this breed depreciates owing to the attacks of the parasites of tick fever. It may be accepted that the Holstein has proved unsuitable as a milch cow for out-of-door life in Jamaica. As regards Guernseys, it is stated that this breed will most probably be found of great value for dairy purposes in Jamaica when suitably acclimatized and hardened by a small infusion of Indian blood from a dairy strain. The value of shorthorns will be referred to in detail later; it may be noted in passing, that the writer of the article under consideration believes that a quarter of shorthorn blood is a suitable proportion for the production of a useful general purpose breeding cow in Jamaica. The chief disadvantage offered by the South Devon breed is that it does not possess sufficient prepotence to stamp its quality on miscellaneous cows of low milking capacity. A good deal of Jersey blood, however, has been used for some time by specialist dairymen in Jamaica, and experience has shown that of all the breeds so far tested the Jersey has proved itself the most prepotent and uniformly successful in stamping dairy quality on the native Jamaican stock.

In regard to the composition* of the average cow's milk in Jamaica, the following table has been reproduced from the article acknowledged above:—

Source.	Total solids.	Fat.	Solids not fat.	Ash.	Specific Gravity. 60°F.
Average milk of 92 Jamaica cows	13·83	5·1	8·69	0·70	1·028
Highest record of above (Barbados cow)	17·49	8·7.	8·79	0·66	1·025
Lowest record of above (Holstein cow)	10·10	2·9	7·20	0·70	1·025
Average of mixed milk from 7 cows as sold to public	13·39	4·7	8·73	0·68	1·028
Legal standard of milk in U.K.		3·0	8·5		
Ditto in U.S.A.		3·25	8·5		
Ditto in Jamaica		3·5	8·25		

Turning to general considerations regarding the improvement of dairy cattle in Jamaica, it is suggested that the most economical and rapid way of improving the quality of native cows, is by using pure-bred bulls. It is stated that it is important to remember that 'unless any breed of imported dairy cattle is capable of acclimatization in Jamaica and of holding its own, in some degree, under our special conditions of climate and of feeding, such a breed should not be utilized for grading up our native cows.'

EUROPEAN BREEDS UNDER TROPICAL CONDITIONS.

One of the reasons why the Holstein is unsuitable is because the skin of this cow is white, whereas that of a true tropical cow, such as the Indian Zebu, is black, although the hair of the animal may be white. The Holstein, therefore, is greatly affected by the tropical sun. It is interesting to note, in continuation of the present subject, that the imported Jersey animals have evidently insufficient capacity for blood renewal to make good depreciation caused by tick fever parasites with improved production of milk. Although it is believed that with care the Jersey can be successfully acclimatized in Jamaica, more useful results would undoubtedly accrue from crosses between this breed and the Indian Zebu, with the object of obtaining animals of larger size. Such half-bred animals have already been raised successfuly. Two bull calves that should prove valuable to breeders in Jamaica have the following composition: ¾ Jersey, $\frac{1}{16}$ Indian, $\frac{3}{16}$ native.

The two remaining breeds dealt with are the Guernsey and the Ayrshire. The former are believed to be the most suitable of all the true dairy breeds of cattle for use in Jamaica; the latter, however, on account of its being similar to the Holstein in regard to colour properties of the skin is peculiarly undesirable for the Tropics.

The above article will be continued in the next issue of the *Agricultural News*, when an account of the possibilities of breeding dual purpose cattle will be described, and useful hints presented in regard to the management of dairy cattle under tropical conditions.

In referring to cattle-rearing in German East Africa, it is stated in *Diplomatic and Consular Reports*, No. 5171—Annual Series, that too little attention has been paid in this territory to the improvement of the native cattle itself, which have several good qualities, and that it would probably repay attention better than unsystematic crossing with imported animals.

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*Figures showing the composition of the milk from different breeds both in Jamaica and Trinidad, will be given in the next issue of this journal.—[Ed. *A.N.*]

FIBRES.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date October 6, with reference to the sales of West Indian Sea Island cotton:—

> The maket had been very quiet for West Indian Sea Island cotton since our last report and no sales have taken place.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending October 4, is as follows:—

> Although the total receipts to date are 82 bales, Factors have not yet sampled or placed them on the market for sale. The market, therefore, has not yet opened, and probably will not for a week or more.
>
> There has been no inquiry for the old crop and we nominally renew our last quotations, viz.:—

Extra Fine	28c. to 29c.	= 16*d.* to 16½*d.*	c.i.f., & 5 per cent.
Fully Fine	26c. to 27c.	= 14¾*d.* to 15¼*d.*	,, ,, ,, ,,
Fine	25c.	= 14¼*d.*	,, ,, ,, ,,
Extra Fine off in preparation	24c. to 26c.	= 13½*d.* to 14½*d.*	,, ,, ,, ,,
Fully Fine off in preparation	22c.	= 12½*d.*	,, ,, ,, ,,
Fine off in preparation	20c.	= 11½*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre up to October 4, 1913, were 1,337 bales, 2,097 bales, and 331 bales, respectively.

MOVEMENT OF THE STOMATA IN COTTON PLANTS.

According to the *Experiment Station Record*, Vol. XXVIII, No. 9, F. E. Lloyd in America, has successfully devised a method for observing in the field the movement of stomata The method, it is said, enables accurate measurements to be made of the living stomata of leaves with a thickness of 5 mm. without any injury to them. The observations on the stomata of the cotton plant showed that they were practically all closed at night. There was a strong tendency to open in the early morning. The perceptible daily opening begins about 6.30 a.m. in Alabama in September, and the maximum is attained at about 8.30 or 9 o'clock, after which closure progresses until 11 o'clock or somewhat later. There is said to be no temporary opening of the stomata during wilting, although a marked rise in the rate of transpiration followed by a sudden reduction of rate was observed about half an hour after wilting begins.

In the study of the amount of leaf water in cotton leaves, the author found it varied in proportion to the dry weight between 318 and 220 per cent. The loss of leaf water is from 7 to 15 per cent. of the initial amount of sunrise. This last is taken as indicative of the daily wilting which begins about the ninth hour. It seems that under usual day conditions the roots are unable to supply loss of water from the leaves, and comparative measurements on the same variety of cotton grown in Arizona showed no more unfavourable reduction of leaf water than in Alabama, when there was sufficient water in the soil.

RUBBER.

THE PROBLEM OF PLANTATION PARA.

There seems to be a growing conviction that the best way to deal with the coming struggle between plantation Hevea and the Brazilian product will be by instituting a central organization for the purpose of conducting co-operative sales. In the *India Rubber Journal* for September 13, 1913, E. G. Windle suggests that a useful purpose would be served by engaging experienced trade travellers in plantation Para, who would be sent round the country to all rubber manufacturers, not necessarily in England only. The central organization, it is suggested, should publish their own journal, and every effort should be taken to demonstrate the capabilities, and push the use of plantation Para.

In the same issue of the journal referred to above, a correspondent outlines in some detail the objects of the suggested organization. It would conduct and regulate sales and, when necessary, restrict output. The organization would further secure uniformity of delivery to manufacturers and promote trade in general. It is suggested that all the plantation companies should be invited to join a general council. Each company's representative would have one vote for every 100 acres planted. The actual selling would be fixed by a Court of Directors appointed by the Council. This Court of Directors, at any time, by a three-fourths majority would be allowed to bring forward a resolution to the General Council for restriction of output.

INITIAL STEP TAKEN BY PLANTATION COMPANY.

The *India Rubber Journal* for September 20 supports in a general way the above suggestion, and, what is even more important, states that the Malacca Company, one of the largest plantation rubber concerns, has notified its shareholders that the company will be prepared to dispose of its entire output of rubber for the next five years through a central selling agency.

In the same issue, Mr. A. A. Bauman calls attention to the fact, that if any central selling association is ever formed, it is essential that it should be managed by those who understand the international market. The same writer brings forward two methods of combined action. The one adhered to by the British Aluminium Producers is recommended for adoption in the selling of plantation Para. According to this method, a Committee of Management is appointed by the companies, and they fix the price of the product from time to time. All the producers bind themselves not to sell under that price—a 15-per cent. margin is allowed for the play of trade, and their books are periodically inspected. It is said that this form of combined action enabled the British Aluminium Producers to raise the price of the metal from £15 to £50.

PESSIMISTIC VIEWS.

In conclusion, it may be added that in some quarters the present position of plantation Para seems to have been regarded somewhat pessimistically, more so than is justified. One hopeful feature of the position is that the present low prices may stimulate manufacturers to buy in great quantity, and to extend their operating plants and thereby make room for the increased output in the near future; and another is that in a few years' time, plantation Para will cease probably to feel any competition from the African sources of supply.

AGRICULTURAL ENGINEERING.

DRAINING LAND TO FREE IT FROM SALT.

It may be remembered that in a recent issue of the *Agricultural News*, an article appeared describing investigations that had been carried out in Porto Rico in regard to the effect of common salt on the growth of sugar-cane, and the improvement of the large tracts of land in that island which are at present unsuitable for cultivation purposes owing to the high salt content. In connexion with this article, another dealing with a new system for draining land and freeing it from salt, which has appeared in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (August 1913), contains information of much practical importance.

The system of drainage about to be described is applicable wherever the surface of the soil is somewhat higher than the water in the main drainage canal, so as to allow a good drainage of the surface water without, however, allowing a good drainage of the subsoil.

The principle of the system will be more clearly understood by reference to the following diagram, which has been reproduced from the journal acknowledged above.

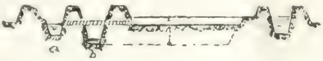

Fig. 26. Cross-section of New Drainage System for Freeing Land from Salt.

The surface drainage water flows into the main drainage canal *a* where it is carried away by gravity. Into the canal *b* run wooden or iron drains, represented by the dotted line, which carry away from the subsoil the rainfall which percolates into it from above. The water in *b* is got rid of by means of a pump.

In the field, the surface water is collected by means of drainage ditches, which must be at least 36 inches deep and about 100 feet apart, the distance depending upon the mechanical and physical properties of the soil. In order to calculate the power of the pumps required, it is necessary to know the amount of water drained per acre and per day. The formulae of Slichter and of King allow an approximate estimation to be made of the quantity of water that can percolate through the soil in a given time.

In regard to the results that have recently been obtained in connexion with this system in Lower Egypt, the amount of water removed was only one-half to two-fifths of that which would have to be pumped according to the usual system. The important point, of course, is that the water removed is ten to 100 times richer in salt than that removed by surface drainage.

Owing to the somewhat larger number of ditches the system just described incurs somewhat greater expense than the usual system of drainage. The expenses of installation and upkeep are also heavier; the difference, however, is not considerable. The loss of cultivable area is between 2 and 3 per cent. The increase in the upkeep rarely exceeds 5 to 10 per cent. The greater expense on installation is about 13*s* to 14*s*. 6*d*. per acre if wooden pipes are used, and 19*s*. to 21*s*. if iron ones are employed.

TRIALS WITH TRACTORS AND MOTOR PLOUGHS IN SOUTH AFRICA.

A short time ago an editorial and several shorter articles in this journal were devoted to motor cultivation, consequently the results of the recent trials conducted during March 1913 near Port Elizabeth, appearing in the *Rhodesia Agricultural Journal* for August 1913, should afford an interesting continuation of the subject

The following tractors competed in the trials: 24 b.h.p. 'Ivel' Agricultural Motor, price £450; 30-60 b.h.p. Rumely 'Oil Pull', type 'E', price £935; 18-20 b.h.p. 'Universal' Tractor, price £375; 50 b.h.p. Maclaren's 'Royal' Steam Tractor, price £690; 15-25 b.h.p. Fairbank's Moss Oil Tractor, price £568; 30-40 b.h.p. Ransom's Special Agricultural Steam Tractor, price £725; 30-50-60 b.h.p. Self-steering Agricultural Oil Motor Tractor, price £950; 25 b.h.p. 'Mogul' Tractor, price £550.

Early in the trials it was realized that difficulties had to be confronted in judging, on account of the variation in power. The comparison between the respective merits of steam and oil tractors is also considered to be a difficult one in South Africa on account of the variation in regard to the proximity of sources of fuel and water-supply.

After a lengthy trial the judges unanimously decided to award the prize of £100 to the makers of the 50 b.h.p. 'Royal' Steam tractor, and a special prize of 25 guineas to the manufacturers of the 18-20 b.h.p. 'Universal' Tractor.

The following information with reference to the winning tractors may be of interest:—

	'Royal'.	'Universal'.
Total area ploughed	2 acres	$\frac{1}{2}$ acre
Time per acre	28 minutes	1 hr. 23 min.
Fuel consumed per acre	80 lb. Natal coal	petrol 2 pints paraffin $3\frac{5}{8}$ gals.
Water evaporated per acre	$51\frac{1}{2}$ gallons	Not measured
Average depth of ploughing	$8\frac{1}{2}$ inches	7 inches
Radius of turning circle	16 feet 5 inches	12 feet
Number of bottoms to plough	8	2

In making the awards, the judges call attention to the outstanding feature of the prize-winning machines. The characteristic feature of the 'Royal' steam tractor was its remarkably low consumption of fuel. This is said to be due largely to the provision of a superheater, a feed water heater, and the lagging of the steam cylinders and valve chests, coupled with the fact that the engine was compound, i.e. steam being passed through two cylinders in place of being passed through one only. It has to be rememberd that against these advantages are the difficulties due to getting up steam and the transport of coal and water. In connexion with the 'Universal' oil tractor, the judges made a satisfactory report but suggested that all the gear should be enclosed and better provision made for cooling and circulating water so necessary in a hot climate. The disadvantage of the 'Ivel' agricultural motor consisted principally in its being provided with only one speed gear and a single road wheel too small in diameter. In general, the chief objection to the oil-consuming motors seemed to be exposure of gearing, cooling arrangements, and the want of two or three-speed gears in the place of one. It will be remembered that this latter point was emphasized in an editorial in this journal dealing with motor cultivation in general.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents and not to the Department.

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Agricultural News

Vol. XII. SATURDAY, OCTOBER 25, 1913. No. 300.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the supply of corn for the West Indies. The article is intended to show that production and consumption of Indian corn in the United States are quickly becoming equalized, which will necessitate, in the near future, an improvement of methods, and an extension of the area under this cultivation in the West Indies.

On page 338 will be found an account of the recently concluded sugar-cane experiments in Antigua.

The breeding of animals in Jamaica for dairy purposes is dealt with on page 341.

An account is given on page 343 of how to drain land in order to free it from salt.

Insect Notes, on page 346, comprise an article describing a recent entomological visit to the United States.

Reviewed on page 347, will be found two new and important works dealing with white sugar manufacture and agricultural chemistry, respectively.

A disease in India known as the tobacco wilt disease is dealt with on page 350.

New Steamship Service between Canada and the West Indies.

The *West India Committee Circular* (October 7, 1913) gives important information concerning the itinerary of the new service of steamers, the first one of which will leave Halifax for the West Indies on December 5, 1913.

There will be four steamers, and they will start from the port of St. John (New Brunswick), and from there to Halifax (Nova Scotia) and thence to Georgetown (British Guiana) every fourteen days, following alternately the undermentioned itineraries:—

(a) Bermuda, St. Kitts, Antigua, Montserrat, Dominica, St. Lucia, St. Vincent, Barbados, Grenada, and Trinidad, and returning from Georgetown to St. John, calling at Trinidad, Grenada, Barbados, Antigua, St. Kitts and Bermuda.

(b) Bermuda, St. Kitts, Antigua, Barbados, Grenada and Trinidad, and returning from Georgetown, calling at the following islands: Trinidad, Barbados, St. Vincent, St. Lucia, Dominica, Montserrat, Antigua, St. Kitts and Bermuda.

From the point of view of Barbados and Antigua it may be observed that there will thus be a direct run from either one place to the other every fortnight. This is a local aspect of the communication of considerable importance.

It may be added that the steamers are to be 5,000 tons cargo capacity and fitted with all modern conveniences. They will steam eleven knots an hour. The time the voyage will take is not stated.

A Twenty-Years' Retrospect.

In his Presidential address delivered before the Agricultural Section at the Birmingham (1913) Meeting of the British Association for the Advancement of Science, Professor T. B. Wood, M.A., spoke of the tendencies and achievements in agricultural research during the last quarter of a century. Particular reference was made to what has been the prevailing custom in regard to manurial and variety trials, namely, the employment of the one-plot method. 'The single-plot method, which suffices to demonstrate results as striking as those given by phosphates on some kinds of pasture land, signally fails when the subject of investigation is concerned with differences of ten per cent. or thereabouts.' In cases of this kind it is necessary, if accuracy is to be ensured, to take at least ten plots in five pairs, in order to reduce the probable error to one per cent.

An extension in this way necessarily involves much trouble and some extra expense; but it must be worth while if only in view of the fact that the best—perhaps the only—way of obtaining the confidence and of arousing the interest of practical agriculturists is by providing them with absolutely reliable results of fairly wide application.

'Agricultural science has now reached that stage of development at which the obvious facts which can be demonstrated without considerable effort have been demonstrated, and further knowledge can only be acquired by the expenditure of continually increasing effort.' This point is one which, we believe, must have the consideration of those responsible for agricultural departments in the West Indies and in the Tropics generally.

Another aspect of the last twenty years, commented on by Professor Wood, was the success that has attended the practice on the part of certain scientific workers to confine their efforts to the thorough solution of specific and circumscribed problems. In this respect reference is made to the researches of Russell and Hutchinson on the partial sterilization of the soil, and to Biffen's notable achievements in regard to the breeding of heavy-yielding and disease-resisting wheats of high quality. Work of this kind is of academic interest, of great educational value, and of immediate practical use to the agriculturist under the widest range of conditions.

Disease of Horses in Berbice.

The fatal disease of horses which appears to be spreading in Berbice was at first considered to be cerebrospinal meningitis, and sometime ago enquiries from British Guiana were made at this Office on the subject of that complaint. According to the Demerara *Daily Argosy* (October 1, 1913), Dr. Minett has now diagnosed the disease as 'mal de caderas', which is a well-known South American disease caused by a blood parasite (*Trypanosoma equina*). There is some indication that the disease may be carried by the biting stable fly (*Stomoxys calcitrans*), which has quite recently been observed in Barbados by the Mycologist of this Department and is known to occur in St. Vincent, Antigua, Montserrat and Jamaica. The Veterinary Officer to this Department has called attention to the risk as regards this disease, involved in the introduction of Venezuelan horses into Trinidad, Barbados and elsewhere. Surra disease has occasionally been said to occur in Barbados, but it is quite possible owing to the similiarity between the symptoms of the trypanosome disease, that what has been diagnosed clinically as surra is really 'mal de caderas', though of course this cannot be said definitely.

At any rate 'mal de caderas' is a very fatal disease, death resulting sometimes in so short a time as three or four weeks; and the indefinite knowledge which seems to exist in regard to its means of spread and diagnosis points the great necessity for further investigation.

In the Demerara *Daily Argosy* (October 12, 1913), a notice appears to the following effect:—

'Viewing with alarm the serious nature of the disease affecting horses and mules in Berbice, and the possibility of the disease reaching Georgetown (Demerara), Mr. E. W. Wills moved at a meeting of the Town Council a motion directing a special inspection by the Health Department of every stable with the object of advising and directing owners as to the precautionary measures that should be taken immediately.'

Two New Indian Exchanges.

These are the *Wealth of India* (a monthly magazine of practical information and useful discussions), and an *Agricultural Journal* of the Department of Agriculture, Bihar and Orissa. The former publication is in its second volume and presents a review of current topics in India; it has a section devoted entirely to agricultural affairs and to co-operative movements. From what we have seen, this agricultural section would be more interesting outside India and possibly more useful within, if greater space were devoted to investigation work and general agricultural progress in India rather than to American and European results.

The agricultural journal is an entirely new publication, to be issued half-yearly. Its contents are confined to agricultural science, and if future numbers maintain the standard set by the first, it is sure to prove useful and popular. Articles are given on entomological, botanical, engineering and on purely agricultural subjects, all well illustrated; but for the information of those who reside in the West it may be added that the greater part of the information is of purely local application. This, of course, for a local departmental publication, is as it should be.

Trade of Grenada and St. Vincent, 1912-13.

The Grenada *Government Gazette* (September 15, 1913) shows that exports of the value of £285,580 were recorded for 1912-13, being £5,706 in excess of the total imports for that year. This is an increase of £20,940 or about 8 per cent. as compared with the year 1911. Of these, the United Kingdom took £169,762 (59 per cent.), the United States £54,726 (19 per cent.) and France £48,437 9*s*. 6*d*. (17 per cent.). Cacao is credited with shipments to the value of £225,317, or about 79 per cent. of the total exports of the Colony. Of this commodity, 56 per cent. went to the United Kingdom, 21½ per cent. to the United States and 22½ per cent. to France. The exports of nutmegs showed an increase from 9,087 cwt. in 1911 to 12,215 cwt. in 1912. Maces and spices also showed an increase. Over 85 per cent. of this produce went to the United Kingdom, and Canada appears for the first time as a recipient of 20 cwt. There has been an increase in the output of cotton (by 335 bales) but that of coco-nuts remains about the same. The year under review was marked by the first shipment of concentrated lime juice (value £123) from Carriacou.

From St. Vincent—according to the *Government Gazette* (September 18, 1913)—the exports amounted to £111,684 or £17,458 less than the imports, and £6,941 less than the exports in 1911. The value of the exports of Sea Island cotton fell from £40,529 in 1911 to £32,073 in 1912. The value of the exports of arrowroot, on the other hand, increased from £40,430 in 1911 to £48,854 in 1912. About 76 per cent. of St. Vincent produce went to the United Kingdom, 22 per cent. to the other British West Indian islands, 3 per cent. to Canada, also about 3 per cent. to the United States.

INSECT NOTES.

AN ENTOMOLOGICAL VISIT TO THE UNITED STATES.

Mr. G. E. Bodkin, B.A., Government Economic Biologist of the Department of Science and Agriculture, British Guiana, recently visited the United States and Porto Rico as a Carnegie Entomological Scholar. The report on this visit has just been received, and the following article has been abstracted from it:—

Early in 1912, the Entomological Research Committee (now the Imperial Bureau of Entomology) made an offer to the Government of British Guiana of a Carnegie Scholarship in Entomology, which was accepted, Mr. Bodkin being chosen as the recipient. The scholarship provided for a subsistence allowance for six months and a sum to cover travelling expenses. Mr. Bodkin left British Guiana on August 7, 1912, and returned on January 22, 1913.

During this time some thirty entomological stations and museums were visited. These included the Headquarters of the U.S. Department of Agriculture, and the U.S. National Museum at Washington, museums in several other large cities, several universities, agricultural colleges, State experiment stations and the special field laboratories of the United States Department of Agriculture in different parts of the country.

In addition to studying the insect pests of many crops and plants which are grown in the Tropics, and the methods of controlling them, Mr. Bodkin had opportunities for becoming familiar with nearly all the large entomological projects which are being worked upon in the United States.

SUGAR-CANE PESTS.

Sugar-cane was studied in Louisiana and in Porto Rico. In the former of these places the insect pests observed were the moth borer (*Diatraea saccharalis*), the sugar cane mealy-bug (*Pseudococcus sacchari*), the sugar-cane beetle borer (*Ligyrus rugiceps*), and the May beetle (*Lachnosterna* sp.). The Argentine ant (*Iridomyrmex humilis*), which is a serious household pest, is also a factor of importance in connexion with sugar-cane cultivation, because of its relationship to the sugar-cane mealy-bug which it protects from its enemies and establishes in suitable places for feeding. The sugar-cane mealy-bug of Louisiana is the one known as the 'grey' mealy-bug (*P. sacchari*), while the common form in the West Indies is the 'pink' (*P. calceolariae*). The injury to the canes in Louisiana by mealy-bug is stated to result from the habits of this insect of collecting in numbers under the leaf sheaths and causing the death of the eyes.

Insect attack in the sugar-cane fields was seen to be much less than in British Guiana. The definite winter season probably has a very beneficial effect by checking development of pests at a certain time. Mr. Bodkin discovered clusters of moth borer eggs parasitized by either the same insect (*Trichogramma pretiosa*) which occurs in the West Indies, or a closely related species. This was the first time this had been observed in the United States. Since then, parasitized moth borer egg clusters have been found in several localities

The Argentine ant is a serious pest. When introduced into a new locality it kills out the species of ants already established there. It is a nuisance in dwelling houses and causes much loss by its attacks on stored food stuffs.

In addition to its protection of the mealy-bug of sugar-cane, it has become a serious pest of citrus trees. The ants visit the blossoms of the orange trees for the nectar, and they also destroy the young embryos, and consequently little or no fruit is produced. Extensive experiments in poisoning these ants by means of a dilute solution of arsenic (sodium arsenite) in a sugar syrup have been carried out. Small pieces of sponge are saturated with the poison mixture, placed in tins or glass jars to prevent the access of rain water, and distributed in situations frequented by the ants. (This system was described in the *Agricultural News*, Vol. X, p. 346.)

In Porto Rico, many of the same insect pests of sugar-cane were found. The small moth borer was everywhere present but not particularly abundant. The white grub was also present and caused a considerable amount of injury. Pigs have been found useful enemies of the grubs in newly ploughed fields. Several parasites are known also to attack them, viz: two wasps, *Campsomeris* [Dielis] *dorsata* and *Elis sexcincta*; and two parasitic flies of the family *Tachinidae*. Another wasp, *Tiphia inornata*, is being introduced from the United States; a parasitic fungus, *Isaria pensa*, is being introduced from France, and a toad from Texas. A species mole cricket is also a pest in fields of young plant canes. The mealy-bug *P. calceolariae* is generally present and at times very numerous.

PESTS OF RICE.

In Louisiana, rice is cultivated on a fairly large scale and here were seen important pests. The rice weevil (*Lissorhoptrus simplex*, Say) is an aquatic insect; the larvae of which attack the roots of the rice plants. A small bug (*Oebalus pugnax*) of the family Pentatomidae attacks the fruiting heads of the rice, sucking the juice from the developing grain. The larvae of the small moth *Chilo plejedellus* bores into the stems, and the sugar-cane beetles (*Ligyrus rugiceps*) attacks the roots.

The rice weevil is captured successfully by means of light traps and the application of crude petroleum to the surface of the water appears to give good results, so far as the experiments with this method have been tried.

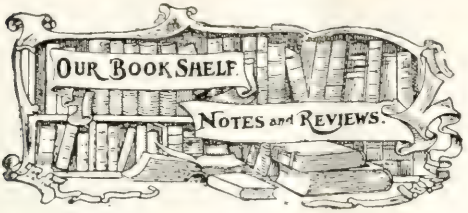
INSECTS ON CITRUS PLANTS.

In California the principal pests are four species of scale insects: the black scale (*Saissetia olea*), the red scale (*Chrysomphalus aurantii*), the yellow scale (*C. aurantii*, var. *citrinus*) and the purple scale (*Lepidosaphes beckii*). Several other pests of minor importance also occur.

The methods employed for the control of scale insects in California are fumigation and spraying. Much valuable work has also been done in the importation and use of natural enemies, but it is found profitable to resort to artificial means of control at times. Fumigation with hydrocyanic acid gas is most generally practised. This method involves the use of expensive tents, but with the valuable nature of the crop the percentage of cost is not great. The distillate (heavy petroleum oil) spray is also used to a considerable extent.

The black scale has been controlled to a large extent by the imported natural enemies, the parasite, *Scutellista cyanea*, but in spite of this, scale insects have been sufficiently abundant to give rise to black blight and sooty mould to such an extent as to necessitate washing or scrubbing of the fruit before packing, and as this injures the keeping qualities of the fruit the attempt is made by means of fumigation to obviate the necessity for this washing

Fumigation must be carried on at night as the poisonous gas is injurious to the leaves in daylight when they are actively performing their natural fuctions. The cost of fumigation is estimated to average about 50c. per tree and it will need to be repeated at intervals of three years.


OUR BOOK SHELF.
NOTES and REVIEWS.

PLANTATION WHITE SUGAR MANUFACTURE.

By W. H. Th. Harloff and H. Schmidt, translated from the Dutch by J. P. Ogilvie. *Norman Rodger.* London, 1913. Price, 7*s.* 6*d.*

Until quite recently the manufacture in the West Indies of white sugar in plantation factories has not been economically worth while owing to fiscal difficulties connected with the United States tariff. Recent changes, however, have altered the position in this respect, and it will now be possible for central factories to consider seriously the introduction of methods whereby the necessary purification can be effected and the refined sugar placed direct upon the retail market. The book under review has therefore appeared at a very opportune moment. This circumstance, taken together with the concise yet comprehensive nature of the carefully classified subject-matter, should ensure the book a rapid sale.

In the first section of the book dealing with the chemistry of white sugar manufacture, the pages dealing with colouring substances in sugar-cane are of particular interest. It would seem that if white sugar manufacture is taken up extensively in this part of the world, the question of colouring matter in sugar-cane varieties will be a factor to be taken into consideration in selection work.

After describing the different forms of fermentation that occur in sugar factories, the book deals next with the manufacturing processes proper. Carbonic acid saturation (cabonatation) is taken first. An interesting and instructive historical account of the process is given, together with details of its employment in beet sugar factories. Some fourteen pages are devoted to double carbonatation, which is recommended for tropical factories, on the score that it is much safer than single carbonatation On the other hand, the single process is much quicker, and the various advantages and disadvantages of the processes are set out in detail on the pages which follow. Much useful information is then presented concerning the supply of carbonic acid and its control.

Before coming to the subject of raw juice sulphitation, an account is given of an intermediate or rather a modified process of the European carbonic acid saturation, known as the acid thin juice process. This consists in principle in sulphuring carbonated juice with a view to the removal of colour occasioned by the action of carbonates on glucose. Although the acid thin juice process may be applied in double as well as in single carbonatation, it appears to be especially applicable to the latter.

Raw juice sulphitation, which next receives attention in the book, is employed much more frequently than is carbonatation. Chemically, the two processes are of a parallel nature and the study of one assists in obtaining an intelligent understanding of the other. Where cane varieties under cultivation are not highly coloured, sulphitation appears to be the more satisfactory process to employ, although it has to be remembered that difficulties in regard to filtration constitute a serious objection to the employment of sulphitation.

In the pages which follow, the methods of operating the process, and the treatment of thick juice are carefully expounded. A final chapter is added on the subject of curing.

PRACTICAL AGRICULTURAL CHEMISTRY.

By S. J. M. Auld, D.Sc., Ph. D, F.I.C, F.C.S., and D. R. Edwardes-Ker, B A, B.Sc. *John Murray,* London, 1913. Price 5*s.* net.

Hitherto there has been no book published in England, one might almost say in English, quite like the work under review. It is essentially a laboratory book, yet by no means merely a guide to analysis. It is an educational book, specially adapted, we are told in the Preface, for candidates preparing for the University of London B.Sc. degree in agriculture. To avoid an entire lack of continuity, the authors have constructed a comprehensive and detailed system of classification, but what is still more important, have introduced before each important practical process, a theoretical account of the point at issue. This greatly enhances the educational value of the book, inasmuch as the student of agricultural chemistry is often at a loss to see exactly where his theoretical teachings fall into line with his practical work. This difficulty the book succeeds in overcoming, to a very large extent.

The first section of the book concerns the chemistry of plant life and includes the detection and determination of the ultimate and proximate constituents of plants. Chapter III of this section is very interesting, and treats of the groups known as alkaloids, glucosides, organic acids, essential oils, tannins, resins and the like, in a new and instructive manner. Section II deals with the soil in its various chemical and physical aspects. In view of their great bio-chemical importance, it is satisfactory to note that bacteria are brought within the student's range experimentally. In the third section, methods of analysing the various manures are given and a special chapter is devoted to mixed manures. Feeding stuffs receive attention next—first concentrated foodstuffs like oil cakes, and then succulent food, such as 'roots', green fodder, etc. Special attention is given to secondary feeding stuffs—molasses, spices and the like.

The last two sections are devoted to dairy products and the examination of waters and soaps.

In general, the employment of this volume in the Tropics can be recommended, since most of the determinations in regard to soils, fertilizers and dairy produce hold good irrespective of local environment. The information, however, in regard to sugar is not sufficiently complete for the requirements of students in cane-growing countries, though it will no doubt be found sufficient to meet the demands of the English student. In the Tropics, reference at least to Clerget's method would be desirable.

One or two points of practical importance in the book appear to be open to criticism, for instance the method given on page 48 in regard to the preparation of calcium citrate, and that concerning ash determination in molasses presented on page 172

On the whole, however, very few faults can be found with the book, which is comprehensive, original and particularly well illustrated—a feature of no little importance in a practical manual.

We are sorry that in the Preface we are unable to join with the authors in regard to an expression of thanks to the compiler of the index—a feature of the book which appears to us to be distinctly inadequate.

GLEANINGS.

There is a large increase in the area of land under cotton cultivation this year in Antigua.

Both the young cane crop and the cotton have improved in St. Kitts since the receipt of rains.

In Dominica, the harvesting of the lime crop is in full operation and will continue well into the present month.

The St. Lucia lime factory is still incomplete, awaiting the arrival of steam coils, condenser, etc. The delay is unfortunate at such a favourable season for starting operations.

Four photographs have just been received of different portions of the British West Indian exhibits at Toronto this year. These photographs are very good and show that the exhibits were well displayed.

A new use for rubber is in the manufacture of a temporary leak stopper. A slab if rubber is held in position on the damaged pipe by means of an iron clamp. (*India Rubber World*, September 1, 1913.)

A meeting of the Management Committee of the Agricultural Society, St. Lucia, has taken place to receive the report relative to recommendations for enlarging the scope of the Society's functions so as to include commercial interests.

It is stated in the *Journal of the Royal Society of Arts* (September 12, 1913), that although the United States shows a preference for West Indian papain, the quality of the West Indian product is not as good as that exported from Ceylon.

Some heavy fines have been inflicted by the authorities in Trinidad for the adulteration of milk. One of the accused had to pay up £47 and 6*s.* 4½*d.* costs with the option of six months' hard labour. (*Port-of-Spain Gazette*, October 1, 1913.)

Of late, more encouraging reports have been received from Montserrat in regard to cotton prospects, which are now considered likely to be much better than was at first thought. If the weather continues at all propitious, the total crop will be above the average.

Reference has already been made in this journal to a minimum price for St. Vincent arrowroot. It was decided recently that this price will neither be raised nor lowered. This decision has been published in order to make the position perfectly clear to buyers.

Analyses of samples of St. Kitts waters, published in the St. Christopher and Nevis *Official Gazette* (September 4, 1913), indicates that the water of that island is of considerable purity. It is evident that no perceptible amount of contamination is taking place through the pipes.

According to *Nature* (September 4, 1913), some very interesting meteorological information has recently been published in *Symons's Meteorological Magazine*, in regard to remarkable correlations existing between the rainfall of Java and Trinidad, and between Trinidad and the south temperate zone.

An intensive system of tobacco culture is being carried out in certain parts of England, the essential feature of which is the employment of travelling hot houses. The covering of the crop some little time before harvesting is said to make a great difference in the quality of the produce. (*The Field*, September 20, 1913.)

From an extract reproduced in the *Voice of St. Lucia* (September 20, 1913), it appears that the *Toronto Globe* (August 28, 1913) has received the impression, as the outcome of visiting the Toronto Exhibition, that the islands of St. Lucia and Montserrat represent the great lime-producing centre of the West Indies.

In the *International Sugar Journal* (September 1913) attention is called to the success which has to some extent followed in Mauritius the use of molasses as a sugar-cane manure when applied three or four months before the cane is planted. It is suggested that a trial under this condition should be made in British Guiana and the West Indies.

According to the Demerara *Daily Argosy*, Mail Edition (September 27, 1913), there has been a large decrease in the amount of balata and rubber shipped from the north-western district of Demerara, chiefly as the result of the severe drought experienced during the latter part of 1911-12, and the first portion of 1912-13. A slight extension of the area under Para rubber has been made.

Interesting information is presented in the *Journal of the Royal Society of Arts* (September 19, 1913) in regard to the mangrove bark industry of Mozambique. The tree is felled between fifteen and twenty years old, the bark losing its valuable properties as the tree approaches forty years of age. It appears that the tree can be cut down a few feet above the ground without killing it, provided the bark is not stripped first. The name of the species of mangrove is not given.

STUDENTS' CORNER.

NOVEMBER.

FIRST PERIOD.

Seasonal Notes.

SUGAR, LIMES AND CACAO.

The principal agricultural operations carried out during this quarter on sugar estates will be the cultivation and manuring of the land for the coming crop. This is done in St. Kitts by the use of the heavy mould-board plough which turns under all the trash left from the old cane and forms a furrow in which are dug the cane holes for receiving the plants. These holes also serve a useful purpose in preventing soil wash during the heavy rains. About this time, green dressings (usually horse beans) are planted on the centres of these holes for turning in as green manure later on. Supplies of cane plants will be needed, and with the central factory system where the estates cannot grind, as was formerly the case, the canes from which the plants are cut, some new arrangement will be required such as a nursery system, lately suggested in a letter in the *West India Committee Circular*.

The idea that any cane is good enough for planting must be entirely given up. Healthy plants of a known and suitable variety should be utilized, and the cuttings must be treated with Bordeaux mixture to keep out disease, to stimulate germination and thereby prevent loss later on in the crop in connexion with 'supplying'.

This year the lime crop being late, there will be further opportunities for observing the details of the manufacture of the different products. Where lime juice is shipped raw, the greatest care is required in preparing a product free from dirt, seeds and pulp. The limes should be washed previous to milling and the juice carefully strained. Describe with diagrams the new mechanical pulpers or strainers now in use.

In preparing concentrated juice, the liquid should be carefully strained and the concentration continued until the hydrometer reads 1·250 in the *boiling* juice. What should this give in ounces per gallon? If possible, determine the amount of acid lost in the process of concentration.

If spring shipments of fresh limes are desired for New York, a dressing of a quick-acting nitrogenous manure, such as nitrate of lime will probably induce flowering. As the lime fruit takes about five months to mature, such dressings must be applied early. For the main crop, manuring is usually carried out in January, and orders should be sent this quarter; when ordering, a guaranteed analysis of each manure should be asked for. Lime planting may still go on, provided the weather is favourable. If planting has to be done on a large scale, a magnetic compass will be found very useful in lining out. Notes should be made of all fields which require drainage. The rainy weather will indicate such spots. Where water lies for any length of time, or where the trees are looking yellow, or where the soil is puddled, drains will prove beneficial.

Towards the end of the quarter, the Christmas crop of cacao will be ripening. In the meantime keep down all suckers and remove all pods that are diseased. There are two ailments of pods which should be distinguished between. One is closely connected with the canker disease of the stem and should be carefully watched for. These diseases are fungoid in origin and develop quickly in wet weather. Spraying has been proved to be beneficial in Trinidad, and should opportunity present itself, it would be well to experiment in this direction in other places also.

As the crop ripens, note the additional yields of fields which were manured.

Now that the hurricane season is over, attention should be given to the grafting of cacao. Observation will have proved the value of grafted cacao trees over seedlings. Care must, however, be exercised in selecting the parent tree. The best trees on the estate should alone be selected for this purpose. The trees must above all things be hardy, capable of resisting diseases, prolific, and produce cacao of good quality.

Questions for Candidates.

PRELIMINARY QUESTIONS.

1. How does a chemical analysis of the soil differ from a mechanical analysis? Which is considered of greater importance in practical agriculture, and why?
2. Describe how the nitrogen in the air is made available to plants (a) naturally, (b) artificially.

INTERMEDIATE QUESTIONS.

1. Write in the form of a diary a general but practical account of the work of a lime estate for a period of twelve months, taking each month separately.
2. What advantages does the rotation of crops afford? What do you consider a suitable rotation for a sugar estate?

FINAL QUESTIONS.

1. Give an account of the machinery and implements on any estate you are acquainted with. What would be about the total cost price of these? Does the annual outlay for repairs and maintenance fall below or above the estimated rate of depreciation?
2. Write an essay (of about 500 words) on either (a) the world's production of cacao or (b) the world's production of cotton.

In referring to the success which has attended West Indian representation at the recent Canadian National Exhibition, the *West India Committee Circular* calls attention to the useful purpose served by this Department's Exhibition booklet: 'The annual booklet issued by the Imperial Department of Agriculture for distribution at these exhibitions, which is entitled this year "The West Indies in Canada 1913", has been revised and greatly improved in many respects, the particulars now covering the whole of the West Indian Colonies and also British Guiana.'

In connexion with a note on the subject of sampling cane for analysis, which appeared in the *Agricultural News* for August 30, 1913, Sir Neville Lubbock writes to point out that another potent factor which helps to cause a difference between the composition of juice in cane reaped from plots and that harvested in the field in the ordinary way, is that the planter or manager leaves as much of the top on the cane as will be permitted by the central factory, whereas in the experimental work the tops are almost entirely removed. This is no doubt that the juice from the same cane with a foot more top will never give the same analysis as the juice from the same cane with the top foot cut off.

FUNGUS NOTES.

TOBACCO WILT DISEASE.

C. M. Hutchinson, in India, has discovered that the annually occurring wilt disease of tobacco plants in Bengal is due to infection with a bacterium possessing characters similar to those of *B. solanacearum*, Smith, which induces a well-known disease of tomatoes.

SYMPTOMS.

The symptoms are at first wilting of the plant followed later by the development of dark-brown streaks in the stems and midribs of the leaves, vissible on the surface and found, on cutting open the former, to extend inwards to the pith and spreading upwards from the point of infection, generally about ground-level, to a distance depending upon the stage to which the disease has advanced.

ISOLATION OF THE CAUSATIVE ORGANISM.

In endeavouring to obtain a pure culture of the causative organism it was found that the method of flaming the infected stem and cutting out externally uncontaminated blocks with a red-hot knife was impracticable owing to the invasion of foreign bacteria. To overcome this difficulty, Hutchinson employed a useful method in which the portion of removed tissue was coated with wax previous to being penetrated by the medium in which a bacterial growth was desired. A large number of commonly occurring saprophytic forms were isolated, amongst which *B. prodigiosus* was present—a matter of interest since the investigator had failed up to that time to find this species in any Bengal soil. As far as one can gather from the paper, *B. solanacearum* was not actually obtained in pure culture, or at least not in sufficient quantity to provide material for inoculation purposes. The infections had to be made with cultures containing a sufficient preponderance of the pathogenic organism to serve as efficient sources for inoculation.

It is important to note that this requisite condition can be determined chemically by means of litmus. This same test is used in connexion with *B. solanacearum* on tomato fruit: tests with litmus showed the juice of the inoculated fruit to be strongly alkaline on the side next to the point of inoculation, and acid on the opposite side.

INOCULATION EXPERIMENTS.

Successful wound inoculation experiments were made with cultures of high virulence, though no infections resulted from applying to the soil water with bacteria in suspension, unless some of the roots happened to be damaged. Old cultures appear to lose their virulence quickly. The virulence of cultures was also reduced to a great extent by keeping, though their parasitic habit was gradually regained by passage through a fresh series of plants.

From the appearance of the diseased tissue, one might ordinarily suppose that the wilting of the plant was caused by a blockage of the vessels with the masses of bacteria. It has been fairly conclusively shown, however, by means of injections into a healthy plant, that the wilting phenomenon is produced by the toxic substances secreted by the bacteria.

FIELD TREATMENT.

It is believed that the organism gains entrance through mechanical injury: possibly on account of root damage at the time of transplanting, or the organisms may obtain entrance through the wounds caused by nematodes. Hutchinson also suggests that the bacteria may gain entrance through the lower leaf scars; for after the common practice of removing the basal leaves, a certain amount of raw tissue is exposed to infection previous to the formation of a cork or a callus covering.

Field practice should aim at the conservation of soil moisture, and development of the root system, which serve to produce better-grown and consequently more resistant plants; hot weather ploughing, if effectively carried out, will not only answer these two purposes but will aid in the destruction of both the infecting organisms and the nematodes. Diseased plants should be burnt: not only the part above the ground but that below also. Such manures as give rise to an alkaline reaction in the soil should be avoided as tending to produce a lower resistant power in the plant to infection, and to increase the number of infecting organisms.

THE STATE MYCOLOGIST IN THE COLONIES.

Under this heading, *Nature* (September 11, 1913) reviews what is apparently a generally instructive handbook of mycology, in spite of the fact that it deals with the diseases of a single host plant, namely the potato, and in a single country, namely Victoria.

The author of the book, Dr. McAlpine, describes in detail *Phytophthora infestans*, *Alternaria solani*, Rhizoctonia, *Fusarium solani*, and *Bacillus solanacearum*. With regard to these diseases, a number of highly interesting experiments and observations are stated to be reported. In the case of *Phytophthora infestans*, it is shown that sporangia can infect the unbroken skin of healthy tubers; and that the mycelium can remain living in a dried up tuber for more than four months. Interesting differences are given in regard to symptoms observed in Great Britain and in Australia, the reason for these being attributed to the prevailing hotter weather in Australia. A series of experiments is described, which shows that the Fusarium of the potato and tomato are transferable.

The reviewer, however, takes exception to a well-known type of statement which appears in the book, involving the use of the word 'probably', often resorted to by biologists to avoid admitting the absence of definite knowledge. Such a type of statement is to be deprecated, according to the reviewer; and although the criticism is just under certain circumstances, it must be remembered that indefinite statements of the kind referred to are really made to sound a note of warning, and to indicate a subject which is undoubtedly worth further investigation. They do more good than harm, assuming, of course, that there exists a foundation of scientific facts.

DEPARTMENT NEWS.

The Secretary of State for the Colonies has been pleased to appoint Mr. W. Nowell, D.I.C., formerly Assistant Superintendent of Agriculture, Barbados, to the office of Mycologist on the Staff of the Imperial Department. Mr. Nowell assumed his duties on the 20th instant.

Mr. P. T. Saunders, M.R.C.V.S., Veterinary Officer to the Imperial Department of Agriculture, left Barbados on Monday, October 20, 1913, by the R.M.S. 'Oruba' for Antigua, to investigate a skin disease of cattle.

SOIL INVESTIGATIONS.

THE EFFECT OF THE LIME-MAGNESIA RATIO ON THE GROWTH OF RICE.

A note in the *Experiment Station Record*, Vol. XXVIII, No. 9, contains the information that Meyer does not believe, and cites evidence to show, that the maximum yield of different plants is dependent upon any fixed ratio of lime to magnesia in the soil. The following results, however, arrived at by P. L. Gile in Porto Rico (see *Porto Rico Experiment Station Bulletin*, No. 12) seem to show that, provided the concentration is sufficiently high, the lime-magnesia ratio is an important factor affecting the growth of rice.

In the presence of a small amount of all the other nutrients, equal percentage concentrations of calcium chloride ($CaCl_2$) and magnesium chloride ($MgCl_2$) appear to be equal in their toxic action on rice. When compared on the basis of equivalent molecular quantities, $CaCl_2$ is more toxic for rice than $MgCl_2$.

With a concentrated solution of $CaCl_2$ containing a minor quantity of the other nutrients, slight increases in the amount of $MgCl_2$ greatly improved the growth of rice. A like improvement was produced in concentrated solutions of $MgCl_2$ by small additions of $CaCl_2$.

In solutions of 172 to 109 parts per 100,000 of the combined chloride of calcium and magnesium, all the other nutrients being present in minor quantity, the growth of rice was distinctly better when the bases, lime and magnesia, were present in the ratio 1:1, than in the ratio of 10:1, 5:1, 1:5, or 1:10. The favourable action of ratio 1:1 compared with other ratios was more apparent the more concentrated the solutions.

In the solutions of 62 to 23 parts per 100,000 of the combined chlorides, all the other nutrients being present, the growth of rice appeared to be unaffected by the ratio of lime to magnesia between ratios of 10:1 and 1:10.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES ON THE LONDON MARKET.

The month of September has passed with very little change, either in the amount of business done, or in the range of prices realized for products since our last report. The exceptions have been that grey Jamaica Sarsaparilla took a firmer tone towards the end of the month, white native Jamaica and kola were both easier. There has been but very little demand for

GINGER.

At the first spice auction on the 3rd of the month 169 bags of Cochin and Calicut were offered and all bought in, plump washed Cochin at 28*s.* per cwt. and fair bright brown Calicut at 31*s.* On the 24th, ginger was represented by 74 bags of Calicut, and these were all bought in at 27*s.* per cwt. for rough wormy brown.

NUTMEGS, MACE, PIMENTO AND ARROWROOT.

At the spice auction on the 10th of the month the very large consignment of 784 packages of West Indian nutmegs were offered, and all sold at full rates as follows: 60's to 70's 6*d.* to 10*d.*, 72's to 82's 5¼*d.* to 7½*d.*, 83's to 93's 4¾*d.* to 6*d.* 105's to 114's 4¾*d* to 5¼*d.*, 127's to 138's 4½*d.* to 5*d.* and 151's to 152's 4¾*d.* A week later, namely on the 17th, nutmegs were again in steady demand, 168 packages of West Indian were brought forward, and found buyers at slightly advanced rates for the medium sizes. Of 24 bags of eastern offered, a few only were sold, some slightly wormy fetching 10*d.* At the last auction on the 24th 135 packages of West Indian were sold, 68's at 7½*d.*, 79's to 85's 5*d.* to 6½*d.*, 98's to 108's 4½*d.* to 4¾*d.*, and 160's to 170's 4½*d.* Mace at auction on the 10th was well represented by 341 packages of West Indian, all of which sold, good pale fetching 2*s.* 3*d.* to 2*s.* 4*d.*, fair to red palish 1*s.* 11*d.* to 2*s* 2*d.*, red and ordinary 1*s.* 8*d* to 1*s* 10*d.*, and broken 1*s.* 4*d.* to 1*s.* 8*d.* On the 24th, 24 packages of West Indian were offered and 18 sold, bold pale and reddish fetching 2*s* 2*d.*, fair to good red 1*s.* 9*d.* to 1*s.* 11*d*, dark red 1*s.* 7*d.* to 1*s.* 8*d.*, and broken 1*s.* 4*d.* to 1*s.* 5*d.* Pimento has been very slow of sale throughout the month: at the first spice auction on the 3rd, 2¼*d.* per lb. was the price quoted, and the offerings amounted to 158 bags. In the middle of the month it was reported that recent sales had been effected of 1,000 barrels of St. Vincent arrowroot at a price averaging 3*d.* per lb.

SARSAPARILLA.

The month opened on September 4th with a fairly steady demand for this article, though the offerings were somewhat limited, namely grey Jamaica 3 bales, Lima-Jamaica 2, native Jamaica 18, and Mexican 15. The whole of the first named found buyers, 1*s.* 10*d.* being paid for fair beardy, and 1*s.* 9*d.* for somewhat coarse. None of the Lima-Jamaica was sold, but the whole of the native Jamaica was disposed of, good red press-packed fetching 9*d.* per lb. and ordinary dull yellowish red 7*d.* to 8*d.* The whole of the Mexican was bought in at 10*d.* per lb. A fortnight later, namely on the 18th, 6 bales of grey Jamaica were brought forward and sold at the following rates: fair 1*s.* 11*d.*, part mouldy 1*s.* 9*d.*, and sea-damaged 1*s* 8*d.*; 6 bales of Lima-Jamaica were also offered but were bought in at 1*s.* 10*d* Of 9 bales of native Jamaica 5 found buyers, good red press-packed fetching 9½*d.*, fair red press-packed 8½*d.*, yellow 7*d.*, and dull medium 6½*d.* per lb.

CASSIA FISTULA, KOLA, LIME OIL, AND TAMARINDS.

At the first drug auction on the 4th of the month 9 bags of Cassia Fistula pods from Dominica were offered and sold at 15*s* 6*d.*, and on the 18th the offering amounted to 45 bags; 14 of West Indian sold at 14*s.* 6*d.* per cwt.; for 31 packages of fair Java 15*s.* 6*d.* was wanted.

On the 4th of the month kola was represented by 22 bags all of which were disposed of, 4½*d.* per lb. being paid for 12 bags of fair bright dried West Indian halves, and the same price for 10 bags of fair bright, partly sea-damaged. A fortnight later the offerings amounted to 86 packages, only 10 of which were disposed of, being good bright, dried Jamaica halves, fetching 4*d.* per lb. At auction on the 17th, 6 packages of lime oil were brought forward, and 4 disposed of, good pale distilled, West Indian fetching 2*s.* 3*d.*, and hand pressed 15*s.* to 15*s.* 6*d.* per lb. At the close of the month tamarinds were well represented at auction by 59 packages of West Indian, 26 of which were disposed of; 14*s.* 6*d.* per cwt. in bond, being paid for fair darkish Antigua; dark juicy Barbados were held at 17*s.* 6*d.*

MARKET REPORTS.

London.—The West India Committee Circular, October 7, 1913.

Arrowroot—*3d.* to 4¼*d.*
Balata—Sheet, 2/3½; block, 1/11½ per lb.
Beeswax—No quotations.
Cacao—Trinidad, 70/- to 77/- per cwt.; Grenada, 63/- to 69/-; Jamaica, 62/- to 68/.
Coffee—Jamaica, 54/- to 80/-.
Copra—West Indian, £32 15*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 1/1 to 1/5; concentrated, £29 10*s.* to £29 15*s.*; otto of limes (hand-pressed), 15/.
Logwood—No quotations.
Mace—Quiet.
Nutmegs—4¾*d.* to 6*d.*
Pimento—Quiet.
Rubber—Para, fine hard, 3/5½; fine soft, 3/2; Castilloa, 1/7 per lb.
Rum—Jamaica, 2/5 to 6/- per gallon.

New York.—Messrs. Gillespie Bros. & Co., October 3, 1913.

Cacao—Caracas, 14¾c. to 16c.; Grenada, 14c. to 14¼c; Trinidad, 14c. to 14½c.; Jamaica, 12c. to 13½c.
Coco-nuts—Trinidad and Jamaica, selects, $40·00 to $41·00; culls, $25·00 to $26·00 per M.
Coffee—Jamaica, 10¾c. to 13½c. per lb.
Ginger—8¾c. to 11c. per lb.
Goat Skins—Jamaica, 48c.; Antigua and Barbados, 44c. to 47c.; St. Thomas and St. Kitts, 42c. to 44c. per lb.
Grape Fruit—Jamaica, $2·75 to $4·00.
Limes—$4·50 to $6·00.
Mace—46c. to 54c. per lb.
Nutmegs—110's, 13½c.
Oranges—Jamaica, $3·00 to $3·50.
Pimento—2⅛c. per lb.
Sugar—Centrifugals, 96°, 3·48c. per lb.; Muscovados, 89°, 2·98c.; Molasses, 89°, 2·73c. per lb., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., October 13, 1913.

Cacao—Venezuelan, $14·75 to $15·00; Trinidad, $14·25 to $14·75.
Coco-nut Oil—$1·29 per Imperial gallon.
Coffee—Venezuelan, 15c. per lb.
Copra—$5·25 per 100 lb.
Dhal—$4·50 to $4·60
Onions—$2·25 to $2·30 per 100 lb.
Peas, Split—$6·20 to $6·25 per bag.
Potatoes—English, $2·40 to $2·50 per 100 lb.
Rice—Yellow, $5·35 to $5·40; White, $4·90 to $4·95 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., October 18, 1913; Messrs. T. S. Garraway & Co., October 11, 1913.

Arrowroot—$5·25 to $6·50 per 100 lb.
Cacao—$15·00 per 100 lb.
Coco-nuts—$24·00.
Hay—$1·50 to $1·60 per 100 lb.
Manures—Nitrate of soda, $70·00; Cacao manure, $50·00; Sulphate of ammonia, $82·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$2·50 to $3·00 per 100 lb.
Peas, Split—$5·50 to $5·75 per bag of 210 lb.; Canada, $4·00 per bag of 120 lb.
Potatoes—Nova Scotia, $2·75 to $3·00 per 160 lb.
Rice—Ballam, $5·30 to $5·40 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $4·00 per 100 lb.

British Guiana.—Messrs. Wieting & Richter, October 11, 1913; Messrs. Sandbach, Parker & Co., October 10, 1913.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	5c. per lb.	——
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per lb.	——
Cacao—Native	12c. per lb.	13c. per lb.
Cassava—	60c.	——
Cassava Starch—	$4·00 to $5·00	——
Coco-nuts—	$16 to $20 per M.	$16 per M.
Coffee—Creole	14c. per lb.	15c. per lb.
Jamaica and Rio	14½c. per lb.	15½c. per lb.
Liberian	12c. to 13c. per lb.	12c. per lb
Dhal—	$3·60 to $4·00 per bag of 168 lb.	$3·50 to $4·20 per bag of 168 lb.
Green Dhal	$5·00	——
Eddoes—	$1·32	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	4c.
Madeira	6c.	4¾c. to 5c.
Peas—Split	$6·00 per bag (210 lb.)	$7·00 per bag (210 lb.)
Marseilles	$3·50	——
Plantains—	10c. to 16c.	——
Potatoes—Nova Scotia	$2·75 to $3·00	$3·00 to $3·25
Lisbon	——	$1·20
Potatoes–Sweet, B'bados	$1·44 to $1·68 per bag	——
Rice—Ballam	No quotation	——
Creole	$4·75 to $5·00	$4·50 to $4·80
Tannias—	$1·56	——
Yams—White	$3·00	——
Buck	$1·92	——
Sugar—Dark crystals	$2·20 to $2·25	$2·20 to $2·25
Yellow	$2·55 to $2·65	$2·55 to $2·65
White	$3·75 to $4·00	$4·00
Molasses	$1·85 to $2·25	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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WEST INDIAN BULLETIN.

(Vol. XIII, No. 4.)

Containing papers on the following subjects:—The Windward and Leeward Islands Considered in Relation to Forestry, by Francis Watts, C.M.G., D.Sc., F.I.C., F.C.S.; Stomatal Characteristics of Varieties of Sugar-cane, by W. R. Dunlop; Cane Syrups or Fancy Molasses, by H. A. Tempany, B.Sc., F.I.C.; Report on the Prevalence of Some Pests and Diseases in the West Indies during 1912, by H. A. Ballou, M.Sc.; Recent Trials with Cotton in Grenada, by Gilbert Auchinleck, B.Sc., F.C.S.; A Plea for Citrus Cultivation in St. Lucia, by A. J. Brooks, F.C.S.; The Tuberculin Test in the West Indies, by P. T. Saunders, M.R.C.V.S.

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IN THE
WEST INDIES.

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A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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Variability of Rainfall.

A MARKED feature of present investigation work in sciences like those underlying agriculture and civil engineering, whose object it is to harness the forces of nature, is the large amount of attention devoted to the study of statistical records. For example, recent examinations of milk records have enabled deductions to be drawn concerning the relation between the quality and yield of milk, whilst similar work has also led to the discovery of what is known as the 'revised maximum'—a quantity deduced from milk records, representing more accurately and more conveniently than the yearly total, the real capacity of an animal's power of lactation. Similarly, in genetics, the collection of statistics over a large number of years is leading to the generalization of rules of great importance in connexion with heredity. In plot experiments, too, it is becoming more and more recognized that reliable results of wide application can be obtained only by regarding a large number of records mathematically, and the combined effect of the general trend exemplified by the above facts inclines one to expect considerable developments in this direction in the future, and the evolution in time, of a class of investigator who will ultimately be known as an agricultural mathematician.

The extremely interesting and important relationships that can be detected as a result of a mathematical examination of numerical records connected with agriculture, is admirably brought out in a recent book* on civil engineering, in which considerable attention is given to variability of rainfall.

The author of this book, in referring to rainfall in general, points out that although the subject is of immediate interest to both agriculturist and civil engineer, it affects each in a different way. The agriculturist is chiefly concerned with the amount of water that percolates into the soil for the use of his crops, whereas the engineer is more concerned with the 'run off' of rainfall and the effect on streams. Both, however, have a common interest in the variability of the rainfall itself, and the investigation of records is therefore interesting from both points of view.

***The Control of Water*, by Philip A Morley Parker. George Routledge & Sons, Limited, London, E.C., 1913.

It is a matter of common observation that the fall of rain in any locality measured in inches per annum, varies from year to year. A study of the rainfall records extending over periods of many years has shown that as the number of years over which the average is taken increases, the average of the yearly rainfall tends towards a constant quantity, and that the average of thirty to forty years varies but little, whatever period of thirty to forty years be taken. This rule has been carefully investigated by Binnie, who examined the records of twenty-six stations with records of an average length of fifty-three years. He found, for instance, that in the case of the mean annual rainfall for five years, the average positive deviation was 15·35 per cent. of the mean, and the average negative deviation 14·52 per cent. of the mean, whilst in the case of the mean for thirty-five years, the average positive deviation was only 1·73 per cent., and the average negative deviation 1·86 per cent., these latter two figures closely approximating to the same thing. The stations at which the observations were made were distributed over a large portion of the globe, and the results may be considered applicable to all insular climates, and, indeed, to most other climates, except those of a very extreme continental type. Binnie's figures also indicate that the annual deviation may slightly increase if the period exceeds thirty-five years; for, whereas the average deviation for thirty-five years was found to be 1·79 per cent. of the mean annual rainfall, the deviation for forty years was found to be 2·16 per cent. For a forty-five-year period it was determined as 2·03 per cent., whilst it dropped at the end of a fifty-year period to 1·98 per cent. It would appear, then, that there is a cycle in rainfall, and that this cycle (which refers not to individual rainfalls, but to the average of three or four consecutive years) seems to have a period approximately equal to thirty-six years. The mean annual rainfall may therefore be defined as the average taken over a sufficiently lengthy term of years to ensure a fairly constant value, and we may assume that thirty to forty years is generally an adequate period. The value of this rule will be readily apparent. If we are in possession of a rainfall record of, say, ten to twenty years, for a place which displays a fairly close relationship with another where a longer record exists, it is only a matter of simple proportion to arrive at a fairly accurate idea of the long-period rainfall at the first locality.

Turning to the study of yearly records in respect of their absolute magnitudes, no definite relationship has been found; but if, again, these be reduced to percentages of the mean annual rainfall for each locality, a very striking regularity will be seen. Such investigation has shown that the rainfall of the wettest of a long series of years is about 146 per cent. of the mean, whereas the rainfall of the driest year is approximately 66 per cent. of the mean.

According to Parker, if the annual rainfall, as defined above, be taken as 100, the following figures deduced from records for the British Isles and N.W. Europe, may be regarded as very close to the truth for all typically insular climates: wettest year 145 to 148; average of two consecutive wettest years, 130 to 133; average for three consecutive years 123 to 126; average for three consecutive driest years 78 to 75; average of two consecutive driest years, 73 to 66; driest year, 66 to 61; maximum number of consecutive years with a fall above the mean, 5·52 to 3·80; average fall of these years, 117 to 123; maximum number of consecutive years with a fall less than the mean, 5·57 to 5·40; average fall of these years, 84 tc 83.

Exceptions to these rules occur in places where the average rainfall is much less than 22 inches yearly, or where the geographical situation is exceptional. According to a communication recently received from Mr. Parker, the West Indian Islands appear to be exceptional so far as the records available can show. The rainfall of Trinidad is normal, but that of Jamaica and the adjacent islands is quite abnormal, the figures being what might be expected in a continent about 1,000 miles from the sea. There appears to be a gradation from Trinidad to Jamaica just like what would occur in working inland over a continent.

It has to be remembered, however, that there are few rainfall records in the West Indies covering a longer period than twenty years, the mean of which is scarcely within the limit requisite for the application of the rules enumerated above. It will be admitted nevertheless, that the whole subject is of the greatest interest and deserving of renewed investigation. The laws of variability of rainfall are also of the greatest economic importance, for in hydraulic engineering projects the rules that have been referred to are commonly employed. Furthermore, the very discovery of them is useful, since it shows the importance of keeping accurate records, and what can be deduced from figures which are frequently regarded as being of merely passing interest and value, but which in reality are gradually unfolding, year by year, some hidden tendency or rule of nature.

SUGAR INDUSTRY.

WHITE SUGAR MANUFACTURE.

Lately when reviewing in this journal a recently published work on the above subject, it was pointed out that the new tariff conditions in the United States give the manufacture of white plantation sugar a lively interest at this time both in the American territories of subtropical and tropical regions, and in the nearer tropical possessions belonging to other countries.

In the *Louisiana Planter* (October 4, 1913), similar views are expressed by Dr. W. E. Cross, who publishes some notes on the subject of white sugar making in the plantation factory. He begins by referring to the fact that in the manufacture of white sugar, the choice of cane is an important matter, the aim being to employ a variety possessing a minimum of colouring matter. The most important step, however, in making white sugar, is the clarification process. Here the utmost care has to be taken that only the purest, clearest juice is sent to the effects. Dr. Cross is of opinion that, of the two processes, sulphitation and carbonatation, the latter undoubtedly gives a more thorough clarification. In Java and Formosa, the carbonatation process has obtained a new popularity in recent years, due mainly to the introduction of the acid-thin-juice process. This process was briefly remarked upon in the recent review in the *Agricultural News* referred to above, but Dr. Cross's notes on the process are rather more detailed. It is pointed out that during carbonatation, the potassium salts which are always present in cane juice are converted into potassium carbonate—a salt which is entirely soluble in juice and syrup. Potassium carbonate being alkaline, has the power of destroying glucose at high temperatures with the production of dark-coloured substances. It is the object of the acid-thin-juice method to change the carbonates into sulphites by treating the juice with sulphur dioxide after clarification. The potassium sulphite has no glucose-decomposing effect, and consequently does not produce any darkening of the juices. According to general opinion in Java, this process is a distinct improvement upon ordinary carbonatation, and it is stated by Dr. Cross that there should be no hesitation in adopting the process in Louisiana, in Cuba, and in other tropical countries. It is no longer a question of will it work, but of what will it cost.

The sulphitation process, although simpler than carbonation is less thorough, and does not produce so large a yield of sugar. The difference in the two processes, however, appears most in the character of the second sugars, the carbonatation seconds being of much lighter colour than those from sulphitation.

An important question to be considered in regard to the effect of a higher acidity during sulphitation is—Does it pay to carry acidity so high as to produce a slight inversion for the benefit of the light-coloured first molasses which will result? This is a question which can be solved in each case by the manufacturer himself.

According to the Annual Report of the Porto Rico Agricultural Experiment Station for 1912, the area that can be profitably planted to this crop has been planted about up to the limit. All the coast lands have been used and cane extended into the hills until losses have occurred to stop the advance.

RUBBER INDUSTRY.

ITS CHEMICAL PROBLEMS.

During September, Professor Dunstan, F.R.S., Director of the Imperial Institute, delivered in London, a lecture entitled Facts and Problems of the Rubber Industry. This is dealt with in the *India Rubber Journal* for September 27.

In discussing the assertion that Para from South America is superior to plantation Para rubber, Professor Dunstan stated that it must be admitted that some plantation rubber has proved to be equal to fine hard Para. In dealing with the question of the quality of plantation rubber, important factors like the age of the tree, frequency and regularity and method of tapping must be taken into consideration. The coagulation of the latex and the preparation of the rubber, like the foregoing, are different in Brazil to what they are in the East, and it is believed that an improvement may be effected as regards these matters in the East by a detailed and scientific investigation of the methods of rubber production and cultivation which obtain in South America.

The lecturer next called attention to the unsatisfactory method at present in vogue for estimating the quantity of caoutchouc by difference. That is to say, at present, the percentages of resin, proteid and mineral constituents are determined, and it is then assumed that the remaining percentage is caoutchouc. Errors in the determination of impurities are therefore reckoned as pure rubber. There is, moreover, evidence to show that what is called caoutchouc may not always be one and identically the same substance; and since the physical properties of any substance must be fundamentally determined by its chemical composition, it is obviously necessary to have a clear understanding of the variations which apparently must occur not merely as regards the proximate constituents of latex, but in the caoutchouc itself.

Professor Dunstan was of the opinion that coagulation of the rubber latex is wrongly classed with the coagulation of milk, and that the change from the liquid of the latex to solid rubber is more akin to the process that is known to the chemist as polymerization and condensation. It would seem that light is likely to be thrown on this important question by a fuller examination of the chemistry of the latex.

The determination of the viscosity of raw rubber solutions affords a promising method of gauging the quality of raw rubber, although at present the determination cannot be wholly depended upon. Tests of the physical properties of the vulcanized rubber are at present probably the most useful in determining the quality of rubber, but in this region also much work remains to be done.

Turning to the subject of synthetic rubber, Professor Dunstan was, as might be expected, of the opinion that the prospects in the near future of large quantities of natural rubber being produced at a cost of less than 1s. a pound makes the chances that synthetically produced rubber will ever be able to complete against it commercially remoter than ever.

In conclusion, the lecturer referred to the large field awaiting investigation, not on the plantations, but in the manufacturing establishments at home. The discovery of new uses is highly desirable, and work still remains to be done in connexion with vulcanization. The present state of unrest in the rubber industry is, according to Professor Dunstan, rather unwarranted, for, although the plantation industry stands in great need of organization and precise investigation, it is intrinsically sound. The truth is, that the rubber industry has grown more rapidly than our knowledge of rubber.

FRUIT AND FRUIT TREES.

COMPOSITION OF THE COFFEE BERRY IN RELATION TO THE MANURING OF COFFEE ESTATES.

During the past three years, considerable attention has been given in Southern India to the manurial requirements of coffee. It has been found that it is quite possible in manuring coffee with a heavy mulch to provide an unbalanced ratio of plant food where nitrogen is in excess and the other essential constituents insufficient to meet the plant's requirements at the proper time. Attention has also been given to the composition of the pulp of the coffee fruit. More recently, the subject of the chemical composition of the coffee berry itself has been investigated. This work has been carried out by Mr. R. D. Anstead, B.A., Planting Expert to the United Planters' Association of Southern India, (and formerly Superintendent of Agriculture, Grenada), in collaboration with Mr. C. K. Pittock. The results of the investigation are published in the *Planters' Chronicle* for September 6, 1913. First of all, a table of analyses is given, which shows that potash is a dominant ingredient in the mineral constituents of the coffee bean. It is suggested that it is only logical to suppose that potash manures should assist the ripening process, and this raises the question as to when this potash should be supplied: Do the coffee berries need it from their very existence as berries, that is, as soon as they have set and the blossom has fallen, or do they need it only towards the end of their development? The same question applies also to nitrogen and phosphoric acid.

To provide an answer, the investigators analysed fresh coffee berries in different stages of development each month from July to January. It was found, as might be expected, that the moisture steadily decreases as the berries increase in size and age. It is believed that this circumstance is a significant one, and suggests a possible fruitful line of research, namely, the study of the physical condition of different types of coffee soils and their moisture content at different times of the year in relation to the ability of the coffee grown on them to hold a big crop.

With regard to the mineral constituents of the berries, there appears to be a markedly steady increase of potash content throughout the period of growth, and from this it is concluded that potash in an available form is needed all the time.

The phosphoric acid content, however, appears to be a constant quantity at first, with a maximum about October, after which it declines. Hence it seems likely that this constituent is needed in an available form chiefly at the beginning of the season.

The nitrogen content increases steadily throughout the period of growth and keeps pace with the increase in organic matter.

From a practical point of view, the results of the investigation are admitted to be not entirely conclusive, but it is suggested that in estate practice the following procedure might well be given a trial. It is suggested that potash manures should be applied before the monsoon or half before and half after; phosphoric acid should be put on half before and half after the monsoon, the after-monsoon dose in an available form. The nitrogen dose might economically be applied after the monsoon in an available form.

The authors state that they are going to carry out field experiments with coffee of known bearing capacity to settle definitely the accuracy of their deductions.

CHARACTERISTICS OF RIPE VANILLA.

The information in this article has been selected and translated from a paper published in *L'Agriculture Pratique des Pays Chauds* (April 1913). It concerns the question of what characters should be considered to indicate the ideal state of vanilla pods previous to their being picked for curing, and it also deals with the differences in density (specific gravity) and loss in weight of pods ripened respectively in the shade and in the sun.

Vanilla is ripe when it splits, and when the yellow colour is confined to the line of dehiscence, the remaining areas being more or less green. A yellow pod is that which, gathered in this state, arrives at perfect maturity without altering, although it is no longer on the tree.

It is commonly said that vanilla is fit to be picked when the thick end of the pod is yellow. This is often true, but not always. If the fruit has its thick end yellow, and if this colour is more pronounced towards this end, and descends towards the narrow end; if the two lines of the sides are yellow from one end to the other, and if the little lines which run down the fruit under the epidermis are also yellow, or almost so, over the entire surface of the pod (underneath and above); and if the 'shine' has disappeared, then the vanilla is in a good state to be picked and will give a good product after preparation. But if it has only its thick end yellow, and if this colour is confined to an area with a more or less clearly defined boundary around the neighbouring green part; if it is shiny, coloured lines being absent as much on the sides as over the whole surface, this vanilla is not fit to be harvested. The thick end of the pod has yellowed because it has touched the substratum, or perhaps because it has received too much sun.

The ripeness of pods from which an oily liquid exudes and which remain green, or those that tend to become brownish-black in colour at the free end, can be determined by means of the two lateral lines. Fruits which split along only a few millimetres of their length become, in due course, completely yellow and then chocolate in colour.

In general, one cannot count upon vanilla in the shade having its thick end yellow before picking; shade-grown vanilla on the plantation will have: (1) a dull appearance over its entire surface, (2) two lateral yellow lines, (3) lines, yellow or yellowish-green, which are situated under the epidermis, and give to all the fruit, a green and feebly yellowish colouration.

In this state, although the yellow colour may be visible only along the two lateral lines, this vanilla will give a commercial product possessing all desirable qualities.

DIFFERENCES IN THE DENSITY (SPECIFIC GRAVITY) OF PODS.

The method adopted in carrying out this investigation was to weigh and then measure, by means of a graduated cylinder containing water, fruit taken (1) from plants growing on their supports in the shade, (2) from plants growing on supporting plants in full leaf but devoid of overhead shade, (3) from vanilla on supports without any shade whatever. It was found, as a result of a large number of measurements, that the density of pods grown in the shade was greater than those which matured in the sun. The means obtained were, for (1), 1·015, (2), 1·013 and for (3), 0·972.

At the end of the article, the detrimental effect of drought and wind is pointed out, and attention is called to the fact that in countries where the degree of humidity of the atmosphere is very great, it is found that vanilla ripened in the sun is richer in essential oil than that which has been allowed to mature in the shade.

LIVE STOCK NOTES.

DUAL-PURPOSE CATTLE IN JAMAICA.

In the last issue of the *Agricultural News*, the possible lines of improvement of native cattle in Jamaica were discussed from the point of view of dairy quality pure and simple; it is now proposed to consider another aspect in the breeding of dairy animals, namely, the production of cattle with a capacity for producing large yields of milk of good quality, and for furnishing superior quality beef. Mr. Cousins, the Director of Agriculture, Jamaica, from whose article published in the *Bulletin of the Department of Agriculture* (Vol. II, No. 7) the information in these abstracts has been taken, points out that not only on large grazing pens, but also in the homes of people with only a few acres of grass land, cows of a dual-purpose type just described are absolutely essential

THE RED POLL BREED.

It has been found in Jamaica that the ideal breed of cattle for the purpose under consideration is the English Red Poll. The animals of this breed possess a short red-coloured coat, and, as a breed, are inured to hard conditions. In Trinidad they have proved a very efficient breed for crossing with cattle of Indian strain, whilst from a commercial aspect, they are moderate as regards first cost. But the chief feature of the Red Poll breed which makes them especially suitable for dual-purpose crossing, is that they are pre-eminently the animals for baby beef, whilst they have no small reputation as regards milk production. Their suitability for the production of baby beef lies in the fact that an animal of the Red Poll breed aged one and three quarter years, is, on the average, fully 28 ℔. heavier in live weight than an animal of the same age belonging to any other breed.

A Red Poll herd has been established at the Government Farm, Hope, and these cattle are registered under herd book numbers together with an affix consisting of a letter and numbers denoting the foundation cow or 'family' of each animal. During 1912, three of the imported Red Poll cows were put to a year's milking test. These cows headed the list at the end of the year with records of over 6,000 ℔. milk each, beating Canadian grade Guernseys and Ayrshires, and all the best Jamaican and Barbadian cows. It may be noted, in passing, that all three of these Red Poll cows had attacks of tick fever during the year, but the disease was successfully treated by means of the Trypan blue treatment. In conclusion the view may be expressed that the Red Polls will eventually prove themselves to be a highly efficient breed of dual-purpose cattle for Jamaica, and there is every reason to believe that equal satisfaction would result from their careful introduction into other West Indian islands as well.

HINTS ON THE MANAGEMENT OF DAIRY CATTLE IN JAMAICA.

The following summary has been compiled from the continuation of the article just abstracted:—

(1) The most certain means of improvement of dairy cattle is by the use of bulls of known pedigree from desirable parents. (2) No cow should, as a rule, be allowed to run with the bull until two months after calving. If possible, each cow should give a calf regularly once a year. (3) Frequently native cows dry off very rapidly when they get in calf; in such cases it is profitable to milk the cows for nine months before putting them to the bull. (4) A bull of imported blood should receive grain feeding; this increases the number of cows he is able to serve, forty to fifty cows to each bull having been found within the range of the herd bulls at the Hope Government Farm. (5) Some bulls exhibit a marked tendency to give a predominence of heifer or of bull calves. For the dairy, a heifer breeder is the most desirable bull to possess. (6) It should be borne in mind that the value of a sire cannot be realized until his daughters come into milk. It is therefore desirable not to part with a bull until his breeding value in the herd has been demonstrated.

(7) In Jamaica, it has been the experience of breeders that a cow's period of gestation is exactly the same as for animals in other countries. (8) Dehorning is desirable owing to the tendency native cattle have to injure one another: the use of a Red Poll bull is perhaps the simplest way to eliminate the horns of native cattle; but if thought desirable, the application of caustic potash to the embryo horns of a calf soon after birth enables the dehorning operation to be effected very simply and without suffering to the animal. (9) If a cow is to be milked without its calf later on, it is highly undesirable to allow any cow to suckle its calf, which should be removed from the cow as promptly as possible. The Tropics appear to accentuate the maternal instincts of dairy cattle. (10) In Jamaica, with Jerseys and Jersey Grades, experience has indicated that two and a half years is the most desirable age for first calving. (11) As regards Red Polls, however, the conclusion is arrived at that native-bred pedigree Red Polls should not be put to the bull until three years old. (12) As regards milking, it is stated that at Hope the operation is conducted twice daily at 5 a.m. and 2 p.m. Records of weight are kept. (13) Any cases of udder trouble should be regarded as infectious. (14) In connexion with the provision of imported feeds it is stated to be a good practice to give dairy cows as many quarts of grain as the cow gives quarts of milk, and to supply to native cows one quart of grain for every quart of milk produced above a standard of 4 quarts per diem A profit of 100 per cent. is indicated from the judicious feeding of grain to dairy cows at the Hope Farm on this basis. No dairy cow which refuses grain feed is worth handling in a dairy herd in Jamaica. (15) The manufacture of ensilage from Guinea corn in the ear and from Guinea grass just arrowing, has proved eminently satisfactory in Jamaica.

DISEASES.

Tuberculosis and contagious abortion appear to be the most serious diseases of dairy cattle in Jamaica. The former disease can be eradicated from a herd by the use of the tuberculin test (see *West Indian Bulletin*, Vol. XIII, No. 4), whilst contagious abortion requires for its prevention great care in disinfection and the isolation of all infected cows. The bull's sheath should be disinfected before serving a cow.

In breeding cattle for the Tropics, the shortening of the coat is a first essential to be aimed at, and although clipping is generally resorted to, it should be remembered that even one-sixteenth of Indian blood has a marked effect as regards the shortening of the coat.

Systematic spraying for ticks is regarded as a *sine quâ non*. 'No cow can produce a normal quota of milk if her blood is to be drawn by hundreds of ticks daily.' Great success has been attained from the use of spraying in Jamaica, particularly with paranaph and with arsenic.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date October 20, with reference to the sales of West Indian Sea Island cotton:—

> There has not been any business passing in West Indian Sea Island cotton since our last report, as spinners supplied their wants for some time ahead with their recent purchases of the balance of last season's crop, and at present they are not inclined to buy further.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending October 18, is as follows:—

> The receipts to date are 416 bales against 560 last year. Factors are disappointed at not receiving larger receipts. They are anxious for the market to open, and are asking for:

Extra Fine	27c. = $15\frac{1}{4}$*d.*	c.i.f., & 5 per cent.
Fully Fine	25c. = $14\frac{1}{4}$*d.*	„ „ „ „
Fine	23c. = $13\frac{1}{4}$*d.*	„ „ „ „
Fully Fine to Extra Fine off in preparation	22c. = $12\frac{1}{4}$*d.*	„ „ „ „

> At these prices they would be willing sellers, as they do not wish their receipts to accumulate.

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre up to October 18, 1913, were 2,187 bales, 2,878 bales, and 725 bales, respectively.

British Cotton Growing Association.—At the one hundred and sixteenth meeting of the Council of the British Cotton Growing Association it was reported that it is yet too early to estimate what the present year's West African supply is likely to be, as the yield largely depends upon climatic conditions: these up to the present have been quite satisfactory. Gratification was expressed at the increased demand which has arisen for the Association's West African cotton.

The Nyasaland Government, it was stated, have made arrangements for the native-grown cotton to be divided into four different grades, for which different prices will be paid according to quality. It is hoped that this regulation will lead to a general improvement. Unfavourable climatic conditions were reported for the cotton crop in the Highlands, which has proved disappointing, although it promised well in the early part of the year. In the lower river districts, however, where the cultivation is largely carried on by natives, the crop will be a good one, and in the aggregate it is hoped that the total exports will not be lower than last year.

The estimate submitted by the Government Agricultural Department of Uganda shows that the cotton crop in that Protectorate for 1913-14 will probably be double the crop of the previous year. Arrangements have been made to send out additional ginning plants to deal with the increased quantity of cotton now being produced in the Protectorate.

THE SOIL

Cupric Treatments and the Nitrification of the Soil.—Owing to the fact that soluble copper salts are poisonous to plants, it might be supposed that the application of sprays and washes containing copper might under some circumstances prove injurious to cultivated plants, particularly after such treatment has been practised over a large number of years on the same land. The idea suggested itself to the Director of the Agricultural Station of Saône-et-Loire, to investigate whether the accumulation of a certain amount of copper in the soil might be injurious to nitrification. In order to investigate the matter, the writer made several series of experiments using solutions of copper sulphate. An account of these experiments is given in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (August 1911).

Assuming that the nitrification of the control was almost complete, the conclusions are that: (1) The presence in the soil of copper salts affords no special obstacle to nitrification: with above 2 per cent. of copper salt, the nitric nitrogen was still 60 per cent. of that contained in the control, and with 0·1 per cent. of copper sulphate the nitric nitrogen rose to 90 per cent. of that in the control. (2) Copper salts introduced into the soil, rapidly assume an insoluble form when in contact with calcium carbonate, iron oxide, and alumina, which accounts for their weak inhibitive action on nitrification, even when large quantities are employed. Finally, seeing that the copper which finds its way into the soil from the alkaline washes is already in an insoluble condition, there is thus no reason to apprehend injurious results from the frequent use of cupric washes.

Subsoil Blasting Demonstration in Trinidad, 1913.—Since there is every possibility of experiments being conducted at Antigua in regard to the employment of dynamite for soil improvement, a short account of a report on similar tests made recently in Trinidad should prove interesting.

According to the *Proceedings of the Agricultural Society of Trinidad and Tobago* (September 1913), an improvement in the crops on certain water-logged plots of land from the use of dynamite has shown itself even after so short a period as three months. This has occurred principally in the case of bananas; but sanguine hopes are held that a similar effect, after a year or two, will be witnessed in regard to cacao. Much success has followed the use of dynamite for making holes for planting coco-nuts, and for blowing up old stumps of trees.

Mr. H. Vincent, who has been conducting the trials, places the cost of the operations at the undermentioned prices:—

Rejuvenating standing cacao	$15 00 per acre
„ old coco-nuts	$15·00 „ „
„ young coco-nuts	$12·00 „ „
Blasting holes for cultivation of coco-nuts	$10·00 „ „

As regards the importation and storage of the dynamite, there should be no difficulties; in Trinidad, the Board of Agriculture have moved and carried a resolution requesting the Government to offer and encourage every facility for the importation, storage and use under competent supervision of dynamite cartridges. Fears that the explosive becomes dangerous on keeping in a hot climate may be dispelled; if anything, it is frost which sometimes makes dynamite, if not handled with the utmost care, liable to undergo spontaneous combustion.

AGRICULTURAL ENGINEERING.

NEW TAPPING KNIVES FOR RUBBER TREES.

It is well known that one of the objections to methods that are commonly employed for tapping Castilloa is that the trees never fully recover from the wounds left by the tapping process. According to the *India Rubber World* (October 1, 1913), this difficulty can be got over by employing a new knife that has just been invented which, instead of cutting out a piece or strip of the bark in the usual way, merely raises the bark from the tree to a sufficient extent to permit the escape of latex. After the operation, the bark is closed down to its original position and allowed to grow fast. It is stated that very little scar is left, and that the process is of great advantage, since it permits a continuous tapping of the tree immediately above or below, or even directly on top of the previous cut. From the illustration given in the *India Rubber World*, the instrument is seen to resemble somewhat a semi-circular comb fitted with a handle. One excellent feature of this new knife is that it is provided with a movable gauge attached to the thumb screws behind the cutting edge, so that the teeth can be quickly adjusted to the proper depth for a tree of any age.

Another interesting knife described at some length in the *India Rubber Journal* (September 13, 1913) is one which is constructed for cutting along the sides of the shallow channel in the outer bark of Hevea rubber trees. This invention comprises the formation on the blade of two or more slots, which extend to one end of the blade. The middle area or tongue in the blade thus formed by the space on each side of it, is bent in a concave fashion so that each edge 'stands proud of' the portions of the blade on each side. These turned-out edges are used for paring the cut, whilst an arrangement of guards operates to prevent the front cutting edge of the portions of the blade each side of the concave tongue, from cutting into the cambium at the bottom of the groove in the tree.

INTRODUCTION OF MOTOR PLOUGHING INTO ST. CROIX.

In order to plough the land deep and prepare it early, with a view to the conservation of moisture, the Director of Agriculture, St. Croix, D.W.I., advocated the use in that Colony of motor ploughs. As the result of discussions at meetings of the Agricultural Society, the Government decided to vote the necessary funds to enable the Director of Agriculture and a representative of the Agricultural Society to visit Cuba and the United States, in order to investigate the question of motor cultivation on the spot.

OBSERVATIONS IN CUBA, LOUISIANA AND TEXAS.

Gasolene motor ploughs were found in extensive use in Cuba on one large sugar estate; the weather, however, had been too wet to allow of the ploughs being seen at work. The engines in use were big four-cylinder gasolene machines, and the owner expressed himself well satisfied with the work they performed. Travelling to Louisiana, the visitors found the same kind of four-cylinder traction engine and plough used in cane cultivation there. The machine was observed at work harrowing land, which was laid out in a series of banks and furrows. A disc harrow was used, and the engine went across the banks quite easily. Later the engine was seen at work in a field which was a mass of weeds, and these checked the plough frequently. The owner explained that this was due to his not having the proper coulters on the machine. The plough was working to a depth of about 7 inches, and six bottoms were drawn by the motor at one time. The engine went over unevenness in the land with great ease and without excessive jerking, and it negotiated the ditches between the fields quite easily by having them filled up with rough logs of wood at the places where the engine crossed. The plough was stated to have done 10 to 15 acres a day, and it was believed it could do more if the fields had not been so small (about 5 acres).

The delegates next proceeded to the State of Texas where they saw one of the 'Twin City' four-cylinder gasolene traction engines at work, ploughing some of the stiffest soil in the United States. The machines were doing excellent work, ploughing a stiff, clay soil filled with the interlacing roots of the Texas 'mesquite' tree, to a depth of 8 or 9 inches. The plough used with the engine was of special design and had only three bottoms, but it weighed 7,000 lb. The engine drew this huge plough irresistibly through the tough root-bound soil, tearing through branches 2 to 5 inches in diameter with the greatest ease. Occasionally, a particularly stiff stump would cause the plough to resist so much that the huge wheels of the engine would revolve without moving it. Then the man in charge would back a few inches and jamb on the clutch, rushing the machine forward, and after a few trials like this, the plough would pull through. The engine ploughed 7 to 8 acres a day of this stiff 'mesquite' land to a depth of 8 or 9 inches. Eight gallons of gasolene and ½-gallon of lubricating oil were used per acre.

As the result of the visit which provided the above interesting observations, the Danish Government have voted the money for a motor-ploughing outfit as already noted in an an article on motor cultivation in the *Agricultural News*, Vol. XII, No. 294. The outfit was expected to arrive about the end of July 1913.

TRIAL OF NEW IMPLEMENTS.

As well as in the introduction of motor traction into the Colony of St. Croix, the Danish Government have exhibited very considerable enterprise in the matter of importing new implements. The following machines are now in the possession of the Department of Agriculture: a corn and cotton planter, a Cuban 22-plough, a Cuban double mould-board fluke, a Magnolia lister, a double mould-board plough, two subsoil ploughs, a 'Secretary' disc plough, a deep tillage 'Stag' sulkey plough, and a potato digger. Nearly all these implements have been found to work well, and their use has been demonstrated to planters. The work of the Cuban 22-plough has been particularly admired, and several of these implements have been imported at the request of planters. The corn and cotton planter has also been purchased by several estate owners. Five or 6 acres of cotton can be planted in one day with one of these machines. The Verity double mould-board plough is stated to be excellent for opening deep furrows for manure or for planting cane, and the Cuban double mould-board fluke is useful for cleaning out the furrow after the Verity plough has done the first work. The 'Secretary' disc plough appears to be capable of performing useful work in cane cultivation, and it has the special advantage of a subsoil attachment which follows in the furrow made by the disc. A 6-acre piece of very heavy clay land has been ploughed in St. Croix by this machine; the soil was turned over with the disc some 8 inches, and the subsoil attachment opened the land some 4 or 5 inches below this. With the deep tillage 'Stag' sulkey plough, stiff land, it is stated, can be readily ploughed 17 inches deep.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents and not to the Department.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the interesting subject of the variability of rainfall. A study of statistics has shown that the mean of the yearly rainfalls, extending over a period of from thirty to forty years, is nearly constant, whatever period of thirty to forty years be taken.

Some of the chemical problems of the rubber industry will be found discussed on page 355.

Under the heading Fruit and Fruit Trees will be found information concerning the manuring of coffee in relation to the composition of its berry, and a large number of details concerning ripe vanilla pods.

On page 357 appears an article on dual-purpose cattle in Jamaica.

Motor ploughing in St. Croix, D.W.I., receives attention on page 359.

Insect Notes, on page 362, constitute a continuation of the article in the last issue of the *Agricultural News* dealing with an entomological visit to the United States.

Fungus Notes, on page 366, include an article entitled Infectious Gummosis of Citrus Trees.

On page 367, an article deals with a subject of great local importance, particularly in the Leeward Islands.

West Indian Bulletin.

The issue of the above journal (Vol. XIII, No. 4), which has just been distributed, contains articles dealing with a variety of subjects of very general scientific interest.

A forestry paper, by Dr. Francis Watts, C.M.G., Imperial Commissioner of Agriculture, gives an interesting general account of the forestry conditions obtaining in the Windward and Leeward Islands, and puts on record important facts and suggestions concerning legislation, and the significance of forestry conditions in relation to the conservation of rainfall.

The paper dealing with the stomatal characteristics of varieties of sugar-cane, by W. R. Dunlop, Scientific Assistant on the Staff of the Imperial Department, claims to show that certain varieties of sugar-cane possess differentiating characteristics as regards the leaf pores through which the plant breathes, and that the curling of the leaf—which varies for different varieties—is probably an important regulating mechanism. It is suggested that the actual economic value of these differences might usefully be investigated in the course of the selection of new seedling varieties, when it might be possible to evolve drought-resisting canes.

The subject of syrup manufacture is dealt with by H. A. Tempany, B.Sc., F.I.C., Superintendent of Agriculture for the Leeward Islands. This paper, which deals in a very comprehensive way with one of the burning questions of the sugar industry, appeared some time ago in a less elaborated form in the *Agricultural News.* It now includes analyses of different syrups, discusses the question of liming and other matters, and provides information in connexion with various economic aspects of the subject.

The paper on Insect Pests and Diseases in the West Indies during 1912, written by the Entomologist on the Staff of the Imperial Department (H. A. Ballou, M.Sc.), is constructed on similar lines to previous reports that have been published in the *West Indian Bulletin*, except that the present paper has been extended to include notes on special features of interest in connexion with the prevalence of plant ailments—an innovation which lends a more lively interest to the important observations recorded in tabular form.

The subject of cotton in Grenada, which is dealt with by G. G. Auchinleck, B.Sc., F.C.S., Superintendent of Agriculture, Grenada, provides a historical account of the industry and discusses very fully the factors which have militated against the successful cultivation of this crop in many localities of the island.

The paper on the Tuberculin Test in the West Indies, by P. T. Saunders, M.R.C.V.S., Veterinary Officer to the Imperial Department, describes, as the title implies, the application of the test and the extent to which it has disclosed the existence of tuberculosis in certain localities.

A Plea for Citrus Cultivation.

The full title of the paper to which the above heading refers, is, A Plea for Citrus Cultivation in St. Lucia. It is written by A. J. Brooks, F.C.S., Assistant Agricultural Superintendent, St. Lucia, and published in the *West Indian Bulletin* just issued. The reason for excluding it from the foregoing note, is that its title possesses a particularly strong significance at the present time in respect of an important change which will take place at the end of this year. The change referred to is the commencement of the new steamship service between Canada and the West Indies. Fast, regular, and provided with cold storage accommodation, these steamers should offer the requisite transport facilities for establishing a greater trade in citrus fruit with Canada.

Grape-fruit, in particular, may be recommended as a safe and suitable variety for shipment, in view of its popularity in America and its good keeping qualities. The paper referred to above gives a detailed account of the cultivation, transport and packing of different kinds of citrus fruits, and for the reasons already given, the appeal of the writer appears to have been made at a particularly opportune time to gain for the subject that attention which it is deserving of.

Life on a Malayan Rubber Plantation.

It seems scarcely in accordance with existing circumstances to begin an article at the present day dealing with rubber production, by asserting that the industry is not the all-absorbing topic it was some time ago. However, it is not from an economic aspect that a writer in *The Field* (October 4, 1913) discusses a Malayan plantation. The article really deals with the life of an assistant, or, as he would be called in the West Indies, an overseer. The work of an assistant consists mainly of superintending labour, for whose work both as reregards quantity and quality, he is responsible. He must keep down the cost of weeding, yet must keep his section clean. He is also responsible for the proper tapping of the trees under his charge.

It would seem to be fairly generally accepted that new assistants experience considerable difficulty at first in regard to the management of labour, and also in connexion with monthly reports and labour returns. This is somewhat significant in respect of the question of agricultural colleges for the Tropics. It may be assumed that such colleges would train a certain number of assistants or overseers. But the one weak point in regard to agricultural colleges in general is that they are for obvious seasons unable to afford wide experience in labour management, which, it must be admitted, is one of the fundamental things in agricultural practice.

A great deal depends upon the personal equation in dealing with labour, but still a great deal can be learnt from special study. Efficiency in the operations themselves may be acquired, the systems of records may be studied, and what is most important in the Tropics, the languages, dialects, and particularly the customs of the various kinds of workers systematically observed.

There is scarcely any other place in the Tropics better suited for studying labour than the West Indies, with its African, East Indian, Chinese, Portuguese and other races. Trinidad is, perhaps, ideally placed in this respect, and from the point of view of the study of labour conditions, this Colony must be considered as particularly well suited as a site for an agricultural college at which estate assistants could be trained and sent to almost any part of the world, well equipped for taking up responsible duties without that probationary period which is frequently found as expensive to employers as it is necessary to their assistants.

Waste in Distribution.

There can be no doubt that waste in distribution for agricultural products is far greater than for manufactured goods. Just as a difference exists in this way, so it occurs among estate products themselves. As was pointed out by Mr. C. R. Van Hise, President of the University of Wisconsin (see *Modern Sugar Planter* for September 27, 1913), this waste occurs principally amongst perishable produce, like fruit and vegetables. It is interesting to observe that the nature of such produce and the fluctuations in acreage year by year cause a large variation of prices. This fluctuation is one of the factors which tends to make the retail cost of perishable goods very high.

When wholesale prices go up, retail prices are promply advanced. When wholesale prices fall, by informal understanding, the retail prices are frequently held at the old rates. This, of course, causes a wide margin between the price the grower receives and that which the consumer pays.

With very perishable goods there are hundreds of instances in thickly populated areas that might be cited to show the waste that accompanies a glut on the market. Thus Mr. Hise says: 'At various times there comes into the markets of the Northern States a larger supply of melons and peaches than can be disposed of at the current prices.

'The retailers take advantage of the situation to purchase at a lower price from the commission marchants; but not infrequently they find it more profitable to them, to maintain existing retail selling prices with smaller sales, than to lower the price sufficiently to dispose of the additional material. Under such circumstances, car-loads, and even ship-loads, of fruit or melons may rot, when the people—and especially the people in less favourable financial conditions—would have been glad to have the products, thus destroyed, if they could have been obtained at a low price.'

Waste in distribution is prevented by employing satisfactory methods, and by regulating the output. The solution to the problem rests on the word co-operation. This raises an interesting point. Why is it that co-operation is hailed as a great advance step for the agriculturist at the same moment that combination in industrial trade and manufacture is assailed? The fact is that there is not the same possibility in agriculture for combination to extend into monopoly as there is in the manufactures; and consequently the consumer does not suffer, but rather, more often than not, benefits. It must be remembered, too, that one food product is in competition with another; and thus, if the producer attempts to push the price of one article too high, the consumer will turn to others.

INSECT NOTES.

AN ENTOMOLOGICAL VISIT TO THE UNITED STATES.

The following article constitutes a continuation from the last issue of the *Agricultural News*, of Mr. G. E. Bodkin's visit to the United States as a Carnegie Entomological Scholar. His observations on pests of sugar-cane, rice and citrus plants have already been dealt with; and we now come to those concerning pests attacking

STORED GRAIN.

Interesting investigations into the habits of insects infesting grain, especially rice, in mills and warehouses, were in progress in Louisiana and Texas, and experiments were being carried out with a view to finding improved means of controlling these pests. Carbon bisulphide, which has been largely used for this purpose, does not penetrate into large masses of closely packed sacks of grain sufficiently to give perfect results. The insects of chief importance in this group are the rice weevil (*Calandra oryzae*), the Angoumois grain moth (*Sitotroga cerealella*), the cigarette beetle (*Tenebrioides mauritanica*), and the saw-toothed beetle (*Silvanus surinamensis*).

PESTS OF COTTON.

The boll weevil is the most serious pest of cotton in the United States and perhaps in the world. At several Federal Experiment stations for the study of pests of field crops the boll weevil is made the principal subject of investigation.

This insect occurs in the Southern United States, Mexico, Guatemala, Costa Rica, and Cuba. In twenty years since its first discovery in Southern Texas, it has spread over an area of 278,000 sq. miles in the cotton-growing area of the Gulf States (see *Agricultural News*, Vol. XII, p. 314). The direct financial loss to cotton growers as a result of the depredations of this pest in one year (1909) has been estimated at over \$88,000,000. Methods of control are under investigation. The use of poisons has not given definite results. The adoption of improved methods of agricultural practice has yielded results of value in the control of the boll weevil.

It would seem that the cotton grower in weevil-infested localities will be compelled either to adopt better agricultural methods or give up cotton growing. In this way, by bringing about a better system of agriculture, including careful rotation of crops, increased production of stock and, consequently, more farmyard manure and better tillage, the boll weevil, although it be a destructive pest, may prove of considerable indirect value, in that it may lead to the establishment of a more diversified and more stable agricultural situation.

Other pests of cotton observed were the cotton worm (*Alabama argillacea*), the cotton flea (*Psallus delicatus*), the cotton red spider (*Tetranychus* sp.), the cotton root louse (*Aphis maidi-radicis*) and the cotton wire worm (*Horistonotus curiatus*).

TICKS.

The cattle tick in the Southern United States is the cause of enormous losses to stock raisers. In Louisiana, at the Baton Rouge Experiment Station, a demonstration dipping tank was in operation. The tank was constructed of concrete, the solution used being a mixture containing white arsenic, washing soda, pine tar and water (the proportions are not given). This has proved very efficacious against ticks, and also against such other pests as lice and horn flies.

PLANT QUARANTINE EFFORTS.

At San Francisco an opportunity was found for studying the very effective system of plant quarantine which is in force at that port, as well as at all other principal ports in California.

In carrying out the provisons of the Quarantine Law all cargo and passenger's, baggage must be inspected on the arrival of all incoming ships, and any insect-infested material is either fumigated or destroyed. A similar system is in force in Porto Rico.

The increasing prevalence of the Mediterranean fruit fly in various countries, and the increased knowledge of the destructiveness of many scale and other insects liable to dissemination on or in plant material, has led to the establishment of these vigorous systems of inspection at the ports of entry in order to safeguard as far as possible the fruit-growing industries.

The quarantine work is in charge of competent entomologists, and the number and variety of injurious insects that are intercepted in the examination of passengers' baggage and cargo would seem amply to justify the expenditure necessary to maintain the work, and the inconvenience caused to the travelling public.

WORK IN CONNEXION WITH NATURAL ENEMIES.

Many other insects and entomological projects were seen and studied by Mr. Bodkin, including the Gypsy moth and browntail moth work in Massachusetts, and the work on the alfalfa weevil in Utah.

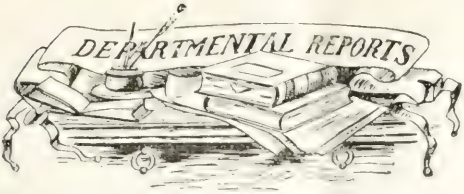
Perhaps the most important feature of each of these investigations, lies in the attempts that are being made to import the natural enemies of these pests from their original homes, and to establish them in their new habitats. A certain amount of success has already attended these efforts, and it is hoped and expected that this line of work will have a most important bearing on the control of insect pests which have accidentally been introduced from other countries.

On the whole, the report reviewed above is of great interest and indicates the enormous amount of good that may be gained by a carefully planned trip such as the one here recorded. It is to be regretted, however, that the subject-matter was not arranged better with a view to easy reference; that is to say, under appropriate subject headings, instead of being presented in the form of a diary account of a long journey.

FROGHOPPER OF THE SUGAR-CANE.

The Bulletins of the Department of Agriculture, Trinidad and Tobago, Nos. 72 and 73 for August and September, last, contain a number of papers on the froghopper of the sugar-cane in Trinidad. Some of these papers are by Mr. J. C. Kershaw and others by Mr. F. W. Urich, Entomologist to the Board of Agriculture. They contain excellent accounts of the insect, its life history, the injury done and the remedial measures which are being carried on against the pest. A number of very good drawings and plates are included and, taken altogether, these papers furnish a very good account of the froghopper.

The use of the green muscardine fungus is being continued, and the removal and the burial of the trash are found to be valuable control measures. The newly discovered parasites of the egg of the froghopper do not appear to be able to increase in numbers with sufficient rapidity to render them very useful in the control of the pest in the cane fields.



TORTOLA: REPORT ON THE EXPERIMENT STATION, 1912-13.

From the outsider's point of view, the most interesting information contained in this report is that dealing with plot experiments with the staple crops and the account given of progress in the chief industries. The section dealing with plot experiments is divided into two parts: that concerning trials with permanent crops, and a second dealing with experiments with annual ones. As regards permanent crop experiments, the report shows that coffee (*Coffea liberica*) and pine-apples are well suited to conditions obtaining in Tortola. The trials with different varieties of sugar-cane should prove useful to peasant cultivators. It would appear from the results that have been obtained that Sealy Seedling and B.109 are well suited to the locality in which they were tried.

Among the annual crops, cotton receives considerable attention. The weather conditions during the year under review were very unfavourable for this crop, and difficulties were experienced in regard to its establishment. The heavy receipt of rain in October stimulated rapid growth, but insect pests multiplied at an equally rapid rate, and there was a serious attack of cotton worms (*Alabama argillacea*) in many districts. In order to enable the peasant growers to deal with this pest, considerable quantities of Paris green were given away free of charge.

Referring more particularly to progress in the chief industries, it is important to note that the value of the lint shipped during 1913 shows a rather large decrease compared with the value for 1912. This decrease, it seems, has only once before been exceeded or even equalled, namely, during the year 1909-10. As regards progress in the minor industries, it is observed that considerable success is accompanying efforts to develop minor cultivations like the bay oil industry, coco-nut planting, and particularly lime cultivation. The number of barrels of lime sent in to the experiment station mill considerably exceeded that recorded for 1911. The report does not hold out hopes as regards success attending the shipment of fresh limes to New York; it is believed that it will pay the grower in the Virgin Islands better to give attention chiefly to the production of concentrated lime juice and lime oil.

The usual interesting list of exports from the Virgin Islands is included in this report, and a comparison of the 1912 figures with those for the previous year shows that the value of the exports had by the end of 1912 fallen 20 per cent. Only in the case of one commodity—fish—has any appreciable increase taken place.

At the end of the report will be found a useful appreciation of the value of Government aid in agricultural affairs in the Virgin Islands, in which Presidency, it will be remembered, the buying, ginning, and sale of the locally grown cotton are entirely in the hands of the Government Agricultural Department.

ST. CROIX: REPORT ON THE AGRICULTURAL DEPARTMENT FOR 1913.*

This report contains a large amount of work which is of considerable interest, particularly since the conditions obtaining in St. Croix (D.W.I.) closely resemble, as may be expected, those of Antigua; hence it is that similar experiences and difficulties have been met with.

The report comprises an account of the results obtained in manurial and variety experiments with the sugar-cane, a description of trials with Sea Island, Sakellarides and other varieties of cotton, together with sections dealing with provision and other subsidiary crops. A large amount of space is devoted to the subject of insect pests, and to the question concerning the introduction of motor ploughing into the Colony. These last two sections of the report will not be dealt with further in this review, but will be treated separately on other pages of this journal.

The manurial experiments with the sugar-cane have not yielded results as conclusive as might be hoped for. Difficulties were experienced in regard to the prevalence of disease in patches in the field, and also in connexion with an unevenness of fertility of the soil in which the canes were grown. In the summary of results concerning the manurial experiments, the St. Croix planter is not advised to use artificial manures for plant canes, except in special cases. In St. Croix, as in Antigua, the limiting factor in cane production is the rainfall. To assist in reducing the ill effects of a low precipitation, deep cultivation and the application of heavy doses of pen manure are strongly advocated.

As regards the tests with varieties, the following canes are, as a result of the experiments, recommended for cautious trial on estates: B.6360, B.18214, B.6450, B.6292 and B.1753. In connexion with the trials with seedling canes raised in St. Croix, considerable progress is being made, and several promising varieties have been produced (e.g. S. C. 12-11); but the general principle deduced from the trials is that no rigid system of selection of seedling canes should be adopted the first year, but that nearly all the seedlings should be saved for a second year's trial.

The experiments with cotton comprise, perhaps, the most interesting subject-matter in the report. With Sea Island cotton, success has followed selection work with Cameron 106, a strain numbered 12-5 being remarkable in that it is a late bearer, remarkably vigorous, and decidedly resistant to leaf-blister mite. After trials had been made with Sakellarides in 1911-12, an attempt was made to cross Sakellarides with Sea Island cotton, and so far as the work of the first crossing goes, the result has been eminently successful, the yield being, in one case, nearly 3,000 lb. of seed-cotton per acre. One plant produced 307 ripe bolls weighing 2½ lb. of seed-cotton.

In considering the introduction of this hybrid on to estates, it has to be borne in mind that the seeds from the hybrid will not, in all probability, breed true. This will necessitate fresh cross-pollination each year—a circumstance which is obviously open to several objections, amongst which are the cost of, and risk involved in raising, the seeds, and the dependence upon an exceptionally heavy yield to counterbalance the lower value per lb. of the hybrid lint compared with the much higher price offered for fine Sea Island cotton. The problem is therefore one which demands the most careful consideration of both the planters and the Agricultural Department.

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* Advance copy in MSS. forwarded for review. The Report has not yet been published.

GLEANINGS.

According to the *Demerara Daily Argosy* (October 11, 1913), the young canes are making very good progress, but the canes now being reaped are lacking in age. The weather has lately been very dry, hot and sultry.

Legislation has been enacted in Jamaica for the compulsory destruction of cotton plants affected with leaf-blister mite. The importation of cotton seed is also put under control. (The *Journal of the Jamaica Agricultural Society*, September 1913.)

In an article in the *Kew Bulletin of Miscellaneous Information* (No. 7, 1913), dealing with the Hull Museum, it is noted that the list of presentations includes samples of lime products received from the Curator, Botanic Station, Dominica.

The *Cuba Review*, in referring to the British Vice-Consul's report at Havana, says that steam ploughing is coming into much more extensive use in the cane fields than formerly. A decided preference is, in general, shown for British machinery of all kinds.

According to *The Board of Trade Journal* (October 2, 1913), India produced in 1912, 295,870,296 ℔. of tea compared with 268,526,197 ℔. in 1911. The area under cultivation has increased since 1885 by 108 per cent. The increase in production has been 314 per cent.

A letter has been received pointing out that the address of Mr. T. A. Siddall, maker of lime-crushing machines, given in Pamphlet No. 72 (Lime Cultivation in the West Indies) as 31, Duke Street, Aldgate, London, E.C., should be 109a Dalmain Road, Brockley Rise, London, S.E.

According to the *Queensland Agricultural Journal* (September 9, 1913), success is likely to attend the introduction of one-farm exhibits in the agricultural shows of that country. The idea is that the exhibit shall represent the result of a diverse and intensive cultivation, and the innovation would seem to be particularly well suited for communities of small holders in the West Indies.

The enormous increase of the pine-apple industry in Hawaii is brought out in an article in the *Louisana Planter* (October 4, 1913). The account referred to shows that in 1901 the number of cases of pine-apples canned in Hawaii was 2,000; in 1912 this reached the enormous figure of 1,318,336. For 1913, the estimated production is 1,600,000.

An interesting publication entitled Notes on the Geology of Jamaica, to which is appended a coloured geological map of the island, has just been received at this office. The author is Mr. Maxwell Hall, M.A., etc. Agriculturally, the information should be useful in regard to soil survey work and in connexion with the question of areas suitable for certain cultivations.

At recent meetings of the Trinidad Board of Agriculture, the proceedings of which were published in the *Port-of-Spain Gazette* (October 12 and 18, 1913), attention was given to the St. Vincent Agricultural Credit Society Ordinance, an account of which has already appeared in the *Agricultural News*. Copies of this Ordinance were distributed amongst the members present.

It is stated in the report issued by the Imperial Education Conference, that the Education Department in Queensland encourages the formation of school gardens. An Arbor Day has been instituted on which prizes are awarded for the best kept garden, and applications for material, tools, etc., are liberally dealt with. A winter course instruction for the teachers at one of the Agricultural Colleges is provided for.

The *United Empire* (October 1913) in referring to Professor Kirkaldy's paper on the Panama Canal read at the recent meeting of the British Association, states that it is believed the West Indies will enter upon a new period of prosperity, especially when the internal combustion engine takes the place of steam, and oil replaces coal. The importance of increasing all-British trade with the Central American republics is also referred to.

Several suggestive and interesting articles appear in the *Barbados Education Gazette*, September 15, 1913. One dealing with the typhoid fly explains in simple but expressive terms how human diseases are spread by this insect; whilst the information dealing with nature study, together with other articles of more general interest should do much to make this useful publication increase in educational value amongst those for whom it is primarily intended.

In the *Journal of the Royal Society of Arts* (October 3, 1913) an interesting list of statistics relating to the Panama Canal is given, from which it is learnt that the total length of the Canal from deep water to deep water is 50 miles. The minimum depth of the Canal is 41 feet, whilst the time of passage of steamers through the completed canal will be ten to twelve hours, three hours being taken during the passage through the locks. The total estimated cost of the canal is £75,000,000.

H.M. Vice-Consul at Fernando Po reports that a concession has been awarded by the Government of the Spanish possessions in the Gulf of Guinea for the working and utilization of the fruit of the oil palm tree, of all the state-owned woods of Fernando Po. The concession, which is for a period of twenty years, does not carry with it any right of ownership to the land covered by the woods. There is a special duty incident on the concession. (*The Board of Trade Journal*, for September 25, 1913.)

STUDENTS' CORNER.

NOVEMBER.

Second Period.

Seasonal Notes.

PERIODIC PHENOMENA OF TROPICAL VEGETATION.

Although the climatic conditions of the West Indian Islands are more uniform than those obtaining in most tropical countries, the difference between the wet and dry seasons is sufficiently marked to influence vegetative growth. In temperate regions, periods of vegetative rest occur as a whole, and are largely due to the effect of winter. In the Tropics, seasonal changes render periodic variation less obvious, and induce resting periods only for certain functions rather than periods of rest for vital processes as a whole; though the dry season in a measure has a similar effect to the winter temperatures of a cold country. The less marked the climate the less dependent on its influence is the periodicity of the plant. In a nearly uniform climate, internal causes are mainly or solely responsible for the alternation of rest, and of activity.

Although popular opinion is to the contrary, tropical forests are for the most part composed of periodically leafless trees, though it has been found that leaf-fall does not occur periodically in respect of climate. Under identical external conditions some trees lose their foliage even before the end of the rainy season, whilst others shed their leaves at the commencement of the dry season; others again do this quite regularly in the course of several months, and lastly, others remain in full leaf until the opening of the resting buds. In some trees leaf-fall may be suspended for many years.

LEAF-FALL A SIGN OF BLOSSOMING.

In all tropical districts with very weak climatic periodicity, there are woody plants that shed their leaves at longer or shorter intervals (one to six times a year) without any connexion with the season of the year, so that trees of one and the same species, under the same external conditions, acquire fresh foliage and shed their leaves at times that do not agree. Cases of the loss and restoration of leaves independently of the season of the year can only be due to internal causes. Frequently such a leaf-fall is a sign that the tree is preparing to blossom.

With regard to periodic phenomena in relation to growth in general, it would seem that evergreen woody plants in districts with precipitations at all seasons of the year are not endowed with continuous growth, but, like deciduous woody plants, experience periodical alternations of rest and activity. More frequent than the simultaneous awakening of the whole crown of the tree is the development at different times of the terminal buds of individual twigs or systems of twigs from the resting to the active conditions. The independence of individual systems of shoots, for instance, is very strikingly exhibited by the mango tree. Its reddish young foliage does not appear at once all over the surface of its immense dark-green crown, but only at one or at two points, corresponding to the system of branches of a longer bough, the terminal buds of which all sprout together, whilst those of other boughs remain at rest.

Questions for Candidates.

PRELIMINARY QUESTIONS.

(1) Name two tropical trees which remain leafless for a considerable period. Give details as regards length of period, time of occurrence, influence of environment and similar circumstances.

(2) How would you proceed to find the area of a field having an irregular boundary?

INTERMEDIATE QUESTIONS.

(1) Write a short account of perodicity in connexion with the blossoming of lime and cacao trees.

(2) Give an account of the cultivation of a field for cotton, which is to be followed by a crop of sugar-cane.

FINAL QUESTIONS.

(1) On what points is information needed in connexion with the fermentation and curing of cacao?

(2) Discuss the West Indies as a market for West Indian produce.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados by the S.S. 'Oruro' on November 7, 1913, for an official visit to St. Lucia. It is expected that the Commissioner will return by the S.S. 'Korona' on the 15th instant.

Mr. H. A. Ballou, M.Sc., Entomologist on the Staff of the Imperial Department of Agriculture, left Barbados by the S.S. 'Parima' on November 8, 1913, for Dominica, with the object of conducting investigations in connexion with citrus pests. Mr. Ballou is expected to return by the S.S. 'Korona' on the 15th instant.

In the last issue of this journal reference was made to a statement which appeared in the *Journal of the Royal Society of Arts*, concerning the alleged superiority of Ceylon papain over the West Indian product. In the same journal for September 26, 1913, the Montserrat Company, Ltd., write to say that they have to take exception to such an assumption. They state that the West Indian papain is so superior to the Ceylon article that it sells readily at a very much higher price, and the demand for it can be met only with difficulty.

The prosperous condition of Fiji is referred to in the *Financier and Bullionist* (September 29, 1913) where the revenue for 1912 is reported to be the highest collected in the history of the colony, and exceeded the revenue for 1911 by no less than £43,552 4*s.* 4*d.* The Fiji Islands cover an area of 7,435 sq. miles, or more than the area of Jamaica, Trinidad and Tobago, the Leeward Islands, the Windward Islands and Barbados put together. Further increase in the population is necessary for full development. The opening of the Panama Canal, it is stated, will prove an important event for these islands.

FUNGUS NOTES.

INFECTIOUS GUMMOSIS OF CITRUS TREES.

In the *Agricultural News*, Vol. XI, p. 206, a summary was given of a paper by O. Butler on Gummosis of Citrus and Prunus. In this it was pointed out that gummosis is a condition that may arise in response to very various stimuli. It may be induced by fungous, insectile, physical and chemical injuries, provided that they affect the cambium layer at a time when growth is taking place and an abundant supply of water is available. Nine fungi and certain bacteria were enumerated as having been identified by various workers with the malady in the two genera named.

The results of a study of gummosis of lemon trees in California are to hand in a paper by H. S. Fawcett, published in the *Monthly Bulletin of the State Commission of Horticulture*, for August 1913. The particular form of the disease described in this paper is that which is characterized by the dying of areas of bark accompanied by the exudation of gum, usually somewhere on the trunk from above the bud union to the forks of the branches. It may be better distinguished by the name bark rot than by the general term gummosis.

The key to the nature of the disease was obtained by the discovery that it could be produced by infection of healthy trees with portions of discoloured bark or wood taken from the edges of a diseased area. It was found that the gum itself could not, as a rule, transmit the infection—a fact which is held to account for the failure of inoculations carried out by previous workers. Two forms of the disease were distinguishable: one in which the outer layer of bark was killed much in advance of the inner, and there was some softening of the bark; and another in which the killing of the inner bark lagged only slightly behind that of the outer, and the bark remained hard as the areas of infection enlarged. Both were proved to be caused by fruit rot fungi familiar in California: the former by *Botrytis vulgaris*, and the latter by *Pythiacystis citrophthora*. Inoculations with the former showed that the lemon is affected readily, the sweet orange less so, and the sour orange scarcely at all.

TREATMENT.

While the author has worked out a method of direct treatment which has given promising results, he emphasizes the importance of hygienic methods in preventing the disease. The methods recommended when the disease was believed to be due to physiological factors have been fairly successful in practice. They consist in keeping the soil away from the bud union, getting good drainage, using sour orange stock for heavy soils, and high budded lemon trees planted high for all new plantings. A method of painting the trees with neatsfoot oil had also been adopted by growers; but this has resulted in damage to many trees, and is shown by the author to encourage actively the growth of the Botrytis, and to do nothing to hinder the growth of Pythiacystis.

The direct treatment now recommended is a simple one, though obviously dependent for its success on careful manipulation. By means of a farrier's knife, or a knife bent sideways into half a hoop and mounted in a wooden handle, the patch of dead bark is cut out, carrying the cut an inch or so outside the discoloured line. Where the bark is not affected down to the cambium only the outer dead part is scraped off. Where the diseased patch is too large for such treatment, it is partly isolated by making a longitudinal slit on each side of it. The area treated by any of these methods is then painted with Bordeaux paste, for which the author gives the following recipe:

BORDEAUX PASTE.

One pound of bluestone (copper sulphate) is dissolved in 1 gallon of water in a wooden or earthenware vessel. This can best be done by hanging it in a sack at the top of the water. Two pounds of unslaked lime, slaked in about ½-gallon of water is then prepared. Stir together when cool, making a light blue mixture about the consistency of whitewash. If the mixture turns some other colour before being applied, it is an indication that something is wrong. Mix up fresh each day or two, as the mixed paste tends to deteriorate with age. It may be applied with a large brush as whitewash.

Exudation of gum may continue for some weeks, but need cause no apprehension if, at the same time, signs of the formation of new healthy tissue can be detected.

RECENT INTERESTING WORK IN VEGETABLE PHYSIOLOGY.

Experiments have been carried out with seeds of *Epilobium hirsutum*, which show that in water, and in the dark, they germinate only very slightly, whereas under otherwise the same conditions 98 to 100 per cent. germinate when exposed to light. According to the *Journal of the Chemical Society* (June 1913), from which this information is taken, the same effect as that produced by light can also be attained by treatment in the dark with solutions of proteoclastic ferments such as papayotin and trypsin, and by low concentrations of acids (0·05N.-hydrochloric acid). It appears, therefore, as if light acts in 'mobilizing' the protein of the seed.

Another investigation of a different kind but of equal interest has been the study made in Florida of the enzymes in the peel of oranges with a view to ascertaining whether any change takes place in their nature or activity at a point at which the fruit becomes sufficiently ripe for consumption. The results of this work are briefly abstracted in the *Journal of the Chemical Society* for July 1913. The peel has been found to contain peroxidase, catylase and invertase enzymes, but no oxidases. During ripening, the weight of the peel decreases in relation to the total weight, whilst that of the juice increases about equally in this relation. The total amount of acid in the juice decreases only slightly, but its concentration decreases considerably, whilst the sugar increases both in concentration and in total amount.

Lastly, according to the issue of the above-mentioned journal for August 1913, an investigator has been conducting further experiments in regard to the occurrence of urea in plants. This substance, as is well known, is one of the simplest amides, and is the chief nitrogenous constituent in the liquid excreta of animals. Working with plant preparations obtained by ordinary expression or maceration in the cold, the xanthhydrol derivative of urea was readily precipitated. Urea has therefore been detected in *Aspergillus niger*, *Penicillium glaucum*, carrot, potato, chicory, turnip, green haricot beans, peas, lettuce, purslane, pumpkin, maize, and a few others.

WEST INDIAN DEVELOPMENT.

OPPORTUNITIES FOR ONION CULTIVATION IN THE LEEWARD ISLANDS.

There can be no question as to the remunerative nature of onion cultivation in the Leeward Islands, particularly in Antigua and St Kitts; nor is there any doubt as to the general suitability of the soil and climatic conditions in these places. Some surprise therefore may be felt that the area devoted to this crop is not greater than it is. According to the report of the Agricultural Superintendent, Antigua, there were in that island during 1911-12 about 55 acres planted in onions, which is a somewhat small area, considering the circumstances that with few exceptions the land in Antigua is very suitable for growing this crop, and that the crop has, so far, suffered from no serious pests and diseases. Moreover, the onions raised in this island have generally fetched high prices abroad. However, from the fact that the seed imported for the 1912-13 crop amounted to 232 ℔.—the largest ever received—it is gratifying to be able to expect that during the past year in Antigua a very considerable extension of this cultivation has been made.

In the island of St. Kitts, on the other hand, there are not the same indications of development as are seen to exist in Antigua. Although small areas in St. Kitts may be found planted on estates here and there, very little consideration is given by planters and small growers to what is, undoubtedly, a very paying and reliable subsidiary crop. The report of the Agricultural Superintendent for 1912-13 shows that plots at the Experiment Station have yielded produce worth at the rate of £37 per acre—a result which should help to attract that attention which the industry deserves.

The reason for the general reticence towards onion cultivation, particularly in St. Kitts, is entirely due to the want of an established outside market. It is true that from Antigua the exports of onions to Canada have of recent years shown a considerable increase (during 1911, Antigua exported onions to Canada worth $1,877, which rose in 1912 to $4,401). Nevertheless, even in Antigua, difficulties of transport and other questions connected with marketing have been felt by the growers, from time to time, but the view may be expressed that these difficulties of transport will disappear after the commencement, at the end of this year, of the new steamship service between Canada and the West Indies. As far as Antigua is concerned, the growers in that island have decided to push the industry, and to co-operate in order to facilitate the export of uniform produce. Quite recently, an organization known as The Antigua Onion Growers' Association has been formally inaugurated. This Association has decided to provide for the inspection of all onions shipped by its members, also, an official brand or stamp, which will be in the nature of a guarantee that the produce exported is well packed, graded and dried. It is hoped in this way to introduce a standard grade for Antigua onions. The Association will make it their aim to be kept informed of the market conditions obtaining in the various centres to which their onions are shipped, and attempts will be made by means of judicious enquiry and advertisement to extend the demand; whilst by co-operating with the Local Agricultural Department (to which the Association is affiliated) it is hoped to derive benefit from departmental instruction and advice, as regards all questions bearing upon production.

It would seem, therefore, in view of the improved communication which will result from the new steamship service, and of the action which has just been taken in Antigua, and the suitability of Antigua, St. Kitts and even the Virgin Islands for onion production, that the time is now at hand for giving the cultivation of onions the closest attention, with the object of developing a greater trade in this commodity between the Leeward Islands and Canada.

DOMINICA.

At present the island of Dominica is steadily progressing in prosperity; the high prices obtaining for lime products, the steadily increasing acreage of bearing limes, the flow of capital, and the generally satisfactory seasonal conditions—all combine to produce an increasing amassment of wealth, and a highly optimistic outlook. Mr. Tempany, B.Sc , F.I.C., Superintendent of Agriculture for the Leeward Islands, from whose report on a recent visit to Dominica these remarks are taken, is further of opinion that the newly established experiments with limes—in some respects the parallel of the now well-known Dominica cacao manurial experiments—will, in all probability, throw a flood of light on the soil requirements of lime plants in Dominica, whilst the success which is attending efforts to establish subsidiary cultivations like vanilla and coco-nuts should in time greatly strengthen Dominica's agricultural position as regards general stability. On one estate, in particular, considerable attention has been devoted to vanilla and, at considerable expense, special buildings for curing the beans have been erected.

Another progressive feature of the year, has been the successful employment of the new écuelling machine, invented in Dominica for extracting lime oil. This machine, Mr. Tempany observed écuelling limes at the rate of about 20 barrels per hour, and extracting something over 2 oz. of lime oil per barrel. In commenting on this contrivance, Mr. Tempany remarks: 'The main question appears to be whether the market for oil of limes is likely to expand sufficiently to allow of a largely increased production. It must furthermore be remembered that a machine such as this will, if further trials justify the opinion I have expressed, almost certainly obtain a vogue in other citrus-producing areas when it becomes known.'

It is now widely recognized that the maintenance of the crop-producing powers of Dominica soils will depend chiefly upon the continuation of a high average precipitation of rain, and upon the preservation of humus in the soil. The question of maintaining the supply of humus involves the intelligent combination of stock-feeding, the utilization of wild bush and the growth of leguminous and other cover crops. The maintenance of the Dominica water-supply is closely bound up with the preservation of mountain forest-land. In the course of time extensive land developments will almost certainly take place, and during this development the greatest care will have to be exercised, and possibly action taken to prevent the sacrifice of the natural advantages just referred to, which are essential to the island's rainfall.

The Financier (September 29, 1913) contains a full page article dealing with the Imperial Department of Agriculture for the West Indies. This article, which is based on an interview with the Imperial Commissioner of Agriculture during his recent visit to England, reviews the present agricultural position in the British West Indies and the openings there for capital.

MARKET REPORTS.

London.—The West India Committee Circular, October 21, 1913; Messrs. E. A. de Pass & Co., October 10, 1913.

Arrowroot—2¾*d.* to 4¾*d.*

Balata—Sheet, 2/10; block, 2/0¼ per ℔.

Beeswax—No quotations.

Cacao—Trinidad, 68/- to 77/- per cwt.; Grenada, 63/- to 69/-; Jamaica, 62/- to 68/.

Coffee—Jamaica, 55/- to 95/6.

Copra—West Indian, £31 17*s.* 6*d.* per ton.

Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.

Fruit—No quotations.

Fustic—No quotations.

Ginger—Quiet, 36*s.* to 62*s.*

Isinglass—No quotations.

Honey—27*s.* to 38*s.*

Lime Juice—Raw, not in request; concentrated, £29 10*s.* to £32; otto of limes (hand-pressed) 14/.

Logwood—No quotations.

Mace—1/6 to 2/6.

Nutmegs—4½*d.* to 6½*d.*

Pimento—2$\frac{3}{32}$*d.* to 2$\frac{5}{32}$*d.*

Rubber—Para, fine hard, 3/2; fine soft, 2/11; Castilloa, 1/9 per ℔.

Rum—Jamaica, 2/6 to 5/- per gallon.

New York.—Messrs Gillespie Bros. & Co., October 17, 1913.

Cacao—Caracas, 14¾c. to 16c.; Grenada, 14c. to 14¼c; Trinidad, 14c. to 14½c.; Jamaica, 12¾c. to 13½c.

Coco-nuts—Trinidad and Jamaica, selects, $40·00 to $41·00; culls, $25·00 to $26·00 per M.

Coffee—Jamaica, 11¼c. to 14c. per ℔.

Ginger—8¾c. to 11¼c. per ℔.

Goat Skins—Jamaica, 48c.; Antigua and Barbados, 44c. to 47c.; St. Thomas and St. Kitts, 42c. to 44c. per ℔.

Grape Fruit—Jamaica, $2·75 to $3·50.

Limes—No quotations.

Mace—48c. to 56c. per ℔.

Nutmegs—110's, 12c. to 12¼c.

Oranges—Jamaica, $1·75 to $3·25.

Pimento—4¼c. per ℔.

Sugar—Centrifugals, 96°, 3·42c. per ℔.; Muscovados, 89°, 2·92c.; Molasses, 89°, 2·67c. per ℔., all duty paid.

Trinidad,—Messrs. Gordon, Grant & Co., October 27, 1913.

Cacao—Venezuelan, $14·75 to $15·00; Trinidad, $14·00 to $14·25.

Coco-nut Oil—$1·16 per Imperial gallon.

Coffee—Venezuelan, 15c. per ℔.

Copra—$5·25 per 100 ℔.

Dhal—$4·60 to $4·75

Onions—$2·30 to $2·40 per 100 ℔.

Peas, Split—$6·00 to $6·25 per bag.

Potatoes—English, $2·40 to $2·50 per 100 ℔.

Rice—Yellow, $5·35 to $5·40; White, $4·90 to $4·95 per bag.

Sugar—American crushed, no quotations.

Barbados,—Messrs. James A. Lynch & Co., Ltd., November 1, 1913; Messrs. T. S. Garraway & Co., October 25, 1913.

Arrowroot—$5·25 to $6·50 per 100 ℔.

Cacao—$14·50 to $15·00 per 100 ℔.

Coco-nuts—$24·00.

Hay—$1·50 to $1·60 per 100 ℔.

Manures—Nitrate of soda, $70·00; Cacao manure, $50·00; Sulphate of ammonia, $82·00 to $85·00 per ton.

Molasses—No quotations.

Onions—$1·89 to $2·75 per 100 ℔.

Peas, Split—$5·50 per bag of 210 ℔.; Canada, $4·00 per bag of 120 ℔.

Potatoes—Nova Scotia, $2·75 to $3·60 per 160 ℔.

Rice—Ballam, $5·30 to $5·40 per 190 ℔.; Patna, no quotations; Rangoon, no quotations.

Sugar—American granulated, $4·00 per 100 ℔.

British Guiana.—Messrs. Wieting & Richter, October 25, 1913; Messrs. Sandbach, Parker & Co., October 10, 1913.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	5c. per ℔.	——
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per ℔.	——
Cacao—Native	12c. per ℔.	13c. per ℔.
Cassava—	60c.	——
Cassava Starch—	$4·00 to $5·00	——
Coco-nuts—	$16 to $20 per M.	$16 per M.
Coffee—Creole	14c. per ℔.	15c. per ℔.
Jamaica and Rio	15½c. per ℔.	15½c. per ℔.
Liberian	12c. to 13c. per ℔.	12c. per ℔.
Dhal—	$3·60 to $4·00 per bag of 168 ℔.	$3·50 to $4·20 per bag of 168 ℔.
Green Dhal	$5·00	——
Eddoes—	$1·32	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	4c.
Madeira	6c.	4¾c. to 5c.
Peas—Split	$6·00 per bag (210 ℔.)	$7·00 per bag (210 ℔.)
Marseilles	$3·50	——
Plantains—	10c. to 16c.	——
Potatoes—Nova Scotia	$3·00	$3·00 to $3·25
Lisbon	——	$1·20
Potatoes–Sweet, B'bados	$1·44 to $1·68 per bag	——
Rice—Ballam	No quotation	——
Creole	$4·75 to $5·00	$4·50 to $4·80
Tannias—	$1·56	——
Yams—White	$3·00	——
Buck	$1·92	——
Sugar—Dark crystals	$2·15 to $2·20	$2·20 to $2·25
Yellow	$2·90	$2·55 to $2·65
White	$3·75 to $4·00	$4·00
Molasses	$1·85 to $2·25	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

Publications on sale of the Imperial Department of Agriculture
FOR THE WEST INDIES.

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Volume XIII, Nos. 1 and 2. No. 3:—Containing Papers on RUBBER: Rubber Experiments in Trinidad and Tobago, by A. E. Collens; Rubber Experiments in British Guiana, by Professor Harrison and others; Castilloa Rubber in Dominica, by Joseph Jones and G. A. Jones: Notes on Cultivation of Para Rubber, by F. Evans; Note on the Present Position of Rubber in Grenada, by G. G. Auchinleck, B.Sc., F.C.S.; Rubber Cultivation, by Dr. P. J. S. Cramer; MISCELLANEOUS: Forestry in Trinidad, by C. S. Rogers; A Method of Estimating Calcium Carbonate in Soils, by H. S. Shrewsbury, F.I.C.; Milking Capacities of the Trinidad Government Farm Cows, by Herbert L. Shrewsbury; The Profitable Breeding of Horses, by J. L. Shannon, D.V.M.

PAMPHLET SERIES.

The Pamphlets are written in a simple and popular manner and the information contained in them is especially adapted to West Indian conditions. They contain, amongst other subjects, summaries of the results of the experiment work on sugar-cane and manures, the full official reports of which have only a limited circulation. The number issued up to the present time is seventy. Those mentioned in the following list are still available: the rest are out of print.

SUGAR INDUSTRY.

Seedling and other Canes at Barbados
in 1900. No, 3, price 2*d*.; in 1901, No. 13, price 4*d*.;
in 1902, No. 19, price 4*d*.; in 1903, No. 26, price 4*d*.;
in 1904, No. 32, price 4*d*.
Seedling Canes and Manurial Experiments at Barbados,
in 1903-5, No. 40, price 6*d*.; in 1904-6, No. 44, price 6*d*.;
in 1905-7, No. 49, price 6*d*.; in 1906-8, No. 59, price 6*d*.;
in 1907-9, No. 62, price 6*d*.; No. 66, price 6*d*.
Seedling and other Canes in the Leeward Islands,
in 1900-1, No. 12, price 2*d*.; in 1901-2, No. 20, price 2*d*.;
in 1902-3, No. 27, price 2*d*.; in 1903-4, No. 33, price 4*d*.;
in 1904-5, No. 39, price 4*d*.; in 1905-6, No. 46, price 4*d*.;
in 1906-7, No. 50, price 4*d*.; in 1907-8, No. 56, price 4*d*.;
in 1908-9, No. 63, price 6*d*.; in 1909-10, No. 67, price 6*d*.
Manurial Experiments with Sugar-cane in the Leeward Islands,
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BOTAN
GARD

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Agricultural Bias in the Teaching of Subjects other than Science.

THOSE who have had experience in the teaching of agricultural science will know that, although a student may possess a fair knowledge of a subject like elementary geometry, the possibility of his applying it in the field and garden is generally very remote. This circumstance is to be regretted for two reasons: firstly, because it means a waste of latent power; and secondly, because it shows that an agricultural bias is seldom if ever given to the teaching of subjects other than science in agricultural or rural secondary schools. It is commonly believed by the general public, that the best that can be done in secondary schools is to establish an agricultural science side, the influence of which is not to permeate the whole school, but merely the handful of pupils who, by means of various inducements like scholarships, have been tempted to join it. That is a great mistake. In a rural secondary school, agriculture, mathematics and languages should constitute one organic whole. It is not intended to imply that the teaching should be made 'utilitarian' in the commonly accepted sense of the term—namely the sacrifice of brain exercises for useful 'tips'—but merely that the student should be led to think in an agricultural 'atmosphere' in an enlightened and original manner.

Agricultural bias can be quite easily given to subjects which seem far removed from agriculture. In the teaching of English, for instance, a list of subjects for composition may include a fair proportion of ones pertaining to agriculture—not necessarily, nor indeed desirably, agricultural subjects which demand for their treatment a very special technical knowledge, but general rural subjects like the uses of cotton, the cultivation of the sugar-cane, or, for students who are capable of dealing with more philosophical questions, the advantages of Land Settlements and so on. How many boys in a West Indian secondary school could write a good intellectual essay on any one of these questions? And yet these subjects bear upon immediate surroundings, and are features of environment about which the student ought to be taught to think, and to observe.

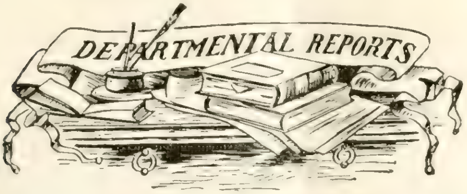
With geometry, as has already been intimated, a pupil may be thoroughly versed in elementary principles, and yet, in the school garden, fail to apply them. He will proceed, for instance, to determine the area of a bed which is, in form, a parallelogram, by the same rule that he would use to calculate the area of a rectangle. This, of course, is partly due to innate carelessness, and to the mistaken idea that it is only necessary to be accurate in the schoolroom. That it is not always due to carelessness is shown by the frequent occurrence of similar misapplications of geometrical knowledge even amongst adults engaged in agricultural practice who might be expected to know better. If, in teaching mensuration in a rural school, the diagrams drawn upon the board were stated to represent so many garden beds, and the imagination of the students sufficiently warmed to think of the forms as beds, they would be taught not only the rules of mensuration, but also that these rules have a very useful application in agriculture. Another matter of importance in the same connexion is the question of approximation. A sound idea of approximation is of the very greatest importance in agriculture. By this is meant a proper realization of the degree of accuracy required in different operations and of the limit of experimental error. This should be taken into consideration also, in the teaching of algebra and arithmetic.

We now come to languages, and the Classics may be considered first. In the tropical Colonies where one may say all secondary schools have to consider agricultural education, the study of Latin and Greek should on no account be entirely dispensed with. It must be remembered that the Tropics comprise new countries; they possess at present few well built towns, no national monuments of science, art, war, or religion to excite the youthful pride, or traditions, to inculcate high ideals and public spirit. Most of this, like the food we eat, has to be imported, and some of it, at least, should come in the form of Greek and Latin. But as well as their value in the above respect, the dead languages afford disciplinary training, assistance in the study of biological terms, and also, incidentally, most instructive lessons in the agriculture of ancient times.

To call upon the modern languages to assist in educating agriculturally is, of course, a necessity; for whilst the study of classical literature in these languages is to be encouraged, there is, it is maintained, little reason why the pupil's vocabulary should not be extended to include the French and German or even Spanish equivalents for English agricultural and scientific terms. This, in after-life would enable, foreign scientific literature to be read and sought after. Ability to do this is, as is well known, a necessary requirement in many of the higher examinations in science.

Geography is to be regarded of the highest value in a liberal agricultural education. It enables the student to compare his own surroundings with those of others; he sees the advantages of transport and communication and learns what are the centres of production of raw material and the markets for the same. The influence of climatic conditions can be studied, and the changing distribution of capital and labour carefully followed. He finds eventually, that his father's estate and the nearest market is not the whole world, but a unit in a huge system of production and consumption.

There seems little more to be said except from the headmaster's point of view. Before considering this side of the subject, it may be well to summarize the views that that we have attempted to express in the foregoing paragraphs. In secondary schools, situated in agricultural communities, it is not sufficient to educate agriculturally by means of agricultural science alone, but through the medium also of the whole curriculum. This does not mean that a change in the present syllabus of work would necessarily have to be made, but simply in its form of presentation. There should, however, be no essential difference in such a school between an 'agricultural' boy and a boy not denominated by this term. The education should be sufficiently liberal in a rural school to allow of a boy in after years taking up an urban occupation, for which by nature he may be especially fitted; and similarly the education in an urban school should be liberal enough to equip a boy for a country life, if he turns out to be particularly adapted for it. Hence, from the headmaster's point of view, the only difficulty should be in obtaining a staff capable of instructing along the lines we have suggested. This difficulty seems in no way insuperable, provided the want is properly advertized and the instruction that is demanded, adequately paid for. The adoption of the above suggestions would be greatly stimulated by a slight modification in the form of the questions set by examining bodies, and it is hoped that within a reasonable period of time, examining bodies like the Cambridge University Syndicate will see fit to take the above principles into account in the presentation of questions, and even to some extent in regard to a general modification of the syllabuses, particularly for Colonial schools, just as this admirable examining body made, ten years ago, the syllabus in botany harmonize with existing tropical conditions.



DOMINICA: REPORT ON THE AGRICULTURAL DEPARTMENT, 1912-13.

This report, which is now being distributed, shows that the weather in Dominica during 1912-13 was, unlike that of the previous year, generally fine and the rainfall considerably below the average. From an agricultural point of view, the climatic conditions were very favourable throughout the Presidency.

Work in the Gardens and the nurseries receives attention first in the report. It is interesting to note that the collection of coniferous trees continues to thrive satisfactorily. As well as being ornamental, these trees are of considerable economic value as a source of hardwood and resin, and as wind-breaks, though up to the present these trees have only been grown experimentally and not for economic purposes in Dominica. It is suggested in the report that other species might be introduced.

EXTENSION OF AREA UNDER COFFEE AND VANILLA.

The total number of economic plants distributed from the Gardens during the year under review was 75,146 as compared with 76,363 in 1911-12. The distribution of lime, grape-fruit, and particularly coffee plants shows a great increase; a reduction has occurred, however, in the number of Para rubber and vanilla plants sent out. Planters appear to be holding back rubber planting until it is seen more definitely what the tapping returns per acre are going to be. The current prices of plantation Para may also be exerting some influence in this respect A considerable extension of the area under vanilla is likely to follow the success which has recently attended efforts in regard to the curing and shipment of this minor product.

In connexion with the above references to rubber, attention may be called to the section dealing with *Castilloa elastica*. Eight quarterly tappings have shown that this tree does not give satisfactory returns in Dominica—a negative result of great importance. On the other hand, much success has followed endeavours to cultivate Eucalypts in Dominica. What is required, from the economic aspect, are species suitable for growing in exposed situations for the provision of cordwood for fuel in the manufacture of lime products. *Eucalyptus tereticornis, E. citriodora, E. rudis, E. rostrata, E. cornuta,* amongst others, will answer this useful purpose.

MYCOLOGICAL INFORMATION.

Turning to the subject of fungus diseases and their control, the report provides valuable information on several interesting points. The so-called stem canker disease is due probably to physical causes—chiefly occasioned by exposure. The black root disease, on the other hand, is induced by fungus (*Rosellinia* sp.), which spreads by means of spores above ground, and by the aid of mycelium below. Red root disease (*Sphaerostilbe* sp.) also infects by means of mycelium in the soil, and possibly by spores also. In the case of all these troubles remedial and preventive measures are given, but there is no doubt that the harmfulness of the diseases is greatly accentuated by a wet season. Drainage and the application of lime help to counteract this climatic encouragement.

HIGH PRICES AND INCREASED EXPORTS.

Progress in the chief industries of Dominica continues to be satisfactory. Evidence of the confidence of capitalists in the staple cultivation—the lime industry—is shown by the development of planting during the past six years. Within that period no less than 326,000 lime plants have been sold from the Government nurseries to local planters. The exports of lime products are equally encouraging. As against 311,377 gallons of raw lime juice shipped in 1911, 508,766 gallons were exported in 1912. This increase was chiefly occasioned by a growing demand for the commodity in Canada The exports of citrate of lime, however, fell on account of the above increase. The demand in London for citrate of lime is firmer than that in Canada for lime juice, and it may be prophesied with a fair degree of confidence that a few years will show a steady increase in the shipments of citrate of lime to the United Kingdom.

The exports of fresh limes show a slight increase. Proper marketing methods are vital for the maintenance of this industry. If the current tendency to ship inferior grades continues, the excellent demand which now exists is bound to fall off. The appointment of a representative of a New York firm in Dominica has served a useful purpose in this respect.

Lime oils continue to command excellent prices, and satisfactory progress in the future is indicated in regard to this branch of the citrus industry. Of a special interest in the present connexion is the new écuelling machine invented in Dominica for the extraction of lime oils. This invention when it becomes known is likely to be employed very extensively in all citrus-growing countries.

EDUCATION AND EXPERIMENTAL WORK.

Efforts connected with instruction in agricultural matters have met with very great success. The Prize-holdings Competitions of past years have had a solid influence on the peasant's point of view, as is evinced by the circumstance that advice is followed, even solicited, without any immediate encouragement in the form of money prizes. In regard to the instruction of agricultural pupils at the Botanic Gardens, the report shows the existence of a satisfactory standard. Good work in the face of certain difficulties is also being done in regard to science instruction at the Grammar School.

The section of the report dealing with the special investigations of agricultural officers contains the report of the select committee appointed by the Legislative Council to enquire into the subject of the necessity for experiments on lime cultivation and manuring. The Council is advised in this report to vote the necessary funds for carrying out these investigations, particularly in the direction of selection work.

The Dominica cacao manurial experiments, which have attracted so much attention in different parts of the Tropics, again show that great financial benefit accrues both on low-lying and on hillside lands from mulching, and to a somewhat less extent from the application of cotton seed meal. The average of six years' continuous trial shows that the application of mulch produced a mean increase of yield amounting to 725 lb. of cured cacao per acre If it is assumed that cured cacao is worth 6*d* per lb. and that the cost of application amounts to 60*s*. per acre, then the net profit resulting from the application of the manure is 302*s*. 6*d*. per acre.

FRUIT AND FRUIT TREES.

THE HYBRIDIZATION OF CITRUS FRUITS IN FLORIDA.

The successful hybridization work of W. T. Springle is well known to horticulturists. Quite recently the *American Breeder's Magazine* (Vol. IV, No. 2) contains a paper by this author on the crossing of different kinds of citrus fruits, mainly with the object of evolving cold-resisting hybrids. Similar work would be of value in the West Indies for the production of citrus crosses possessing good keeping qualities (for transport), and disease-resistant characters.

The most important achievement in the history of the Florida work was the effort made in 1897 to originate hardy citrus fruit by crossing the common orange with the hardy Chinese *Citrus trifoliata*. Out of 212 crosses three fruits were secured which yielded thirteen true hybrids. When these fruited they turned out to be a new type of citrus fruit and were named the citrange. This fruit varies greatly in size, shape and colour, but has always an abundant acid juice of an aromatic and slightly bitterish taste. Citranges are cold-resisting plants. One kind of citrange contains a peel which does not have the disagreeable odour that is common to the rind of most. The tree of the citrange itself—particularly the rusk kind—is very ornamental, being loaded in Florida with white blooms in spring, and with brilliant red fruits in autumn. The rusk is the most prolific of all the citranges and the most precocious, frequently bearing the third year after budding. The Willets citrange is interesting, in view of the fact that it exhibits a tendency to freakishness in shape, becoming sometimes a mass of finger-like segments.

At the same time that the original citranges were made, another hybrid was produced between the tangerine, orange and grape fruit. The resulting fruit was also of a new type and was named Tangelo. Although subject to great variation, tangelos show little of the grape fruit and almost nothing of the tangerine, but are in effect new types of oranges having a greater variability as to size and colour, and having as a rule more sprightly flavour, in this respect approaching somewhat to the grape fruit. There can be no doubt that the hybrids called tangelos constitute an important source of new and improved citrus fruits for commercial culture.

West Indian readers will be interested to learn that another new type of citrus fruit is the limequat, which Swingle originated in 1909 by crossing the common West Indian lime with the kumquat orange. As the author remarks, there is no need to point out that the lime is, of all the commonly grown citrus plants, the most delicate. In the hybrid limequat this delicacy is found to have disappeared to a considerable extent. Limequats vary in size from that of a large orange to that of a small lime. The skin is thin, and of agreeable aroma and flavour. The degree of acidity varies greatly.

In conclusion, reference may be made to the importance of a thorough knowledge of the wild relatives of any cultivated group like the citrus family. The full force of this statement is appreciated by a consideration of the case of the 'desert lime' or 'desert lemon' (*Atalantia glauca* [Lindl.] Benth.), which was found growing in the ice-bound regions of Australia. Here was the hardiest of all the evergreen citrus trees; nevertheless until within quite recent years it failed to attract the attention of plant breeders in any part of the world, though it is obvious that this species must be much more promising for use in breeding hardy citrus hybrids than, for instance, the trifoliate orange.

A PHILIPPINE BANANA COLLECTION.

It is interesting to record that the Bureau of Agriculture, Manila (see *Philippine Review*, 1913,) has decided to make a collection of the some 276 varieties of bananas and plantains that have from time to time been recorded, with the object of determining which varieties are best suited for home use, which for commercial export, and which for manufactured products—'figs', 'flour', 'coffee', 'chips', etc.; also with the object of working out the synonomy of the varieties.

One reason why the work has not been started before by older established departments appears to be the difficulty that was thought to exist in regard to the transportation of planting material. It is now certain, however, that there are at least two possible methods of sending banana roots over practically any distance—for instance, from Porto Rico to the Philippines: the Wardian case method of transporting small living plants in a ventilated glass-covered shipping box, and the dry root method of packing the bulb-like base of the sucker in a ventilated package of mailable size.

The investigation contemplated will prove decidedly interesting. In order to know just what sorts should be propagated on a large scale for distribution, it is necessary that comparative tests be made, including as many native and introduced varieties as possible; except by doing this, it is practically impossible without spending a great deal of time and money in travelling, to say definitely just what are the synonyms of any given variety. It is stated that it will never be possible perhaps to collect all the 250 to 350 kinds of bananas in one experimental plantation; but if the planters and horticulturists and botanists of the Tropics will lend their assistance, we shall soon have a collection of these fruits as the basis of actual information, which will be a land mark in the history of tropical horticulture.

It may be interesting in conclusion to refer briefly to the subject of the origin of bananas. The concensus of opinion is strongly in favour of the Indo-Malayan region as the home of at least a large part of the Musas. Tropical Africa contains a great number of wild and semi-cultivated species and varieties besides a considerable number of cultivated sorts, which very evidently have been introduced from the Indo-Malayan regions. Throughout the Malayan Peninsula, Assam, and the back districts of Siam and Indo-China, there are probably a large number of little-known species and varieties of wild and semi-cultivated sorts. Some of these were undoubtedly the parents, so to speak, of the varieties now under cultivation throughout the Tropics.

Von der Meden & Co., of Mark Lane, London, have placed at the disposal of this Office interesting statistics in regard to the shipments of British West Africa and San Thome cacao. The largest supplies of West African cacao arrive between November and February. During 1912-13, the largest receipt for a single month from West Africa was 9,800 tons during December. This is greater by over 1,000 tons than the amount shipped during the same month of the previous year, and very much above amounts received in England during former years.

LIVE STOCK NOTES.

STUDIES OF INHERITANCE IN HORSES.

Since 1787, the Trakehnen stud, in Germany, has been the centre for producing East Prussian pedigree half-bred horses. Analysis and the comparative study of the pedigrees show that the best breeding results were obtained by in-breeding.

The selection work has included systematic observations on the transmission of hereditary characteristics, and the following extract, taken from an article on the Trakehnen investigations, published in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (September 1913), shows some of the interesting and important facts that have been brought to light. Mendelian inheritance of coat colour is dealt with first:—

> White is dominant over all other colours in horses; a white horse can only be obtained if one of its parents is white, but white horses when mated do not always produce white offspring. Chestnut is always a recessive colour. Bay is recessive as regards white and dominant as regards chestnut.
>
> It is, however, not possible by means of Mendel's theory to foretell which colour will prove dominant. According to the writer, more light is thrown upon this question by an examination of the animal's pedigrees. Thus he cites instances of great power of coat colour transmission taken from the breeding records of Trakehnen and based on colour pedigrees. Contrary to the opinion of Von Ottingen, the writer considers that a black coat can be transmitted with a fair amount of constancy. The writer attributes the presence of white hairs to the use in in-breeding of white horses.
>
> In conclusion, the writer has examined all the Trakehnen breeding material from the point of view of the transmission of hereditary defects. His observations have led to the conclusion that a pathologic fold of the eyelids is hereditary. The transmission of this defect seems to be more marked in the maternal line. At Trakehnen, periodic opthalmia was found to be hereditary in some cases, and not in others. The writer considers that tick is hereditary and can be transmitted by animals which have not got the disease.
>
> Roaring was also proved to be hereditary. Spavin, navicular disease (Schale), and broken windedness were not transmitted by animals which are much affected by them. It seems that there may be a predisposition in foals to paralysis.

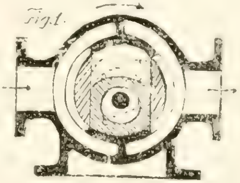
Epizootic Lymphangitis.—This disease of horses is common in most of the West Indian islands, in some of which it is known as erysipelas. The disease, which is a contagious one, was very prevalent during the South African war. More recently in Uganda it has been considered necessary to include epizootic lymphangitis amongst the diseases of the Cattle Disease Ordinance, Uganda, 1902.

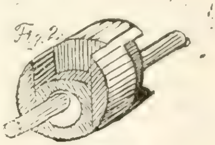
An account of the disease was given in the *West Indian Bulletin*, Vol. XII, p. 72. In addition to this information, readers of this journal will be interested to learn that, according to the *Experiment Station Record* (Vol. XXVIII, No. 8), the disease has been successfully treated with neosalvarsan. 'Six of seven cases of epizootic lymphangitis to which 1·5 grains of neosalvarsan to 250 cc. distilled water was administered intravenously were completely cured, and the author [E. Hondemer] thinks that the seventh horse, which was nearly cured would certainly yield to a second injection.'

AGRICULTURAL ENGINEERING.

A NEW PUMP FOR ESTATE WORK.

This pump is distinguished by its extreme simplicity, by the facility with which it can be set, and by its perfect uniform action.





The *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (September 1913) describes the mechanism as follows:—

'It consists, as may be seen from the annexed figures, of a cylindrical body closed on two sides by plates, one of which bears the suction pipe and the other the forcing pipe. Within the body revolves another cylinder, in each of the faces of which a deep groove is cut at right angles to the one at the other end, and a block of metal like a water-tight piston slides in each of the grooves. These blocks are traversed and driven by two diametrically opposed excentrics fixed on the driving shaft, which occupies a slightly excentric position towards the axis of the cylindrical body of the pump.

'Fig. 1 is a section of the apparatus showing the arrangement of the working parts. Fig. 2 is a perspective view of the movable parts.'

Electricity and Crop Production.—An interesting article appears in the *Journal of the Board of Agriculture* (October 1913) on electricity and crop production. Recent experiments have shown that the immediate problem is the provision of a genuine control area, for a control area unaffected by the discharge cannot be obtained within hundreds of yards on the leeward side of the electrified area. It has been decided to use screens of galvanized iron wire but even then the discharge will probably have to be stopped whenever a strong wind is blowing from the electrified area towards the control. It is added that these experiments must be continually accompanied by purely physiological work in the laboratory for the purpose of determining accurately the effect of electrical discharge upon each plant function, such as transpiration, photosynthesis and the like.

Much satisfaction has accompanied the employment of lead labels in the Botanic Gardens, Grenada. These are made with letter punches. In a recent communication, the Superintendent of Agriculture, Grenada, points out that the set of punches is very useful for making indestructible labels for bags of soil, plant specimens, etc.

Incidentally the employment of these labels has proved cheaper in the long run than using wooden ones. Some arrangement is required to ensure a perfectly neat effect.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date November 3, with reference to the sales of West Indian Sea Island cotton:—

Since our last report the sales of West Indian Sea Island cotton have been confined to about 100 bales St. Croix 15*d.* to 16*d.*, 30 bales Virgin Islands 15*d.* to 15½*d.*, about 10 bales superfine St. Kitts at 21*d.* and a few stains at 10*d.*

The American Carolina crop appears to be a good one this season and 'Extra Fine' is offering from Charleston about 15*d.* This cotton will compete seriously with all West Indian cotton which is not superfine in staple.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending November 1, is as follows:—

There has been some demand for export during the past week resulting in sales on a basis of: Extra Fine 26c., Fully Fine 24c., and Fully Fine off in preparation at 20½c. to 21c. At these prices the Factors are willing to continue selling, but refuse to make any further concessions. From now on the receipts will be larger and afford a good offering stock from which we will be able to buy satisfactorily.

No sales have been made as yet of Planters' crop lots.

We quote, viz.,

Extra Fine	26c.	=	14¾*d.*	c.i.f., & 5 per cent.
Fully Fine	24c.	=	13¾*d.*	" " " "
Fine 22c. to	23c.	=	12¾d. to 13¼*d.*	" " " "
Fully Fine off in preparation	20½c.	=	12*d.*	" " " "

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre up to November 1, 1913, were 2,885 bales, 3,328 bales, and 965 bales, respectively.

Condition of Peasant Cotton Growers in Antigua.—At the suggestion of the Superintendent of Agriculture for the Leeward Islands, the Agricultural Superintendent, Antigua, has made an inspection of the peasant cotton cultivation in that island. The area under this crop was found to be unexpectedly large; exact figures are not available, but at a very rough estimate it is believed that the total area in the two districts situated in the English harbour quarter approaches 300 acres.

The most important question attendant on peasant cotton growing is the provision of Paris green for the control of the cotton worm. Most of the importers obtain the poison in packages containing 14 lb. and upwards. Merchants are naturally unwilling to break these packages for the purpose of retailing small amounts, but recently, owing to the special conditions of the case in Antigua, a firm is retailing London purple loose at 9*d.* per lb. The Superintendent of Agriculture laid the suggestion before the Government that Paris green and London purple should be provided on the credit system. Apparently arrangements have been made to carry this suggestion into effect. A special leaflet has been issued containing instructions in regard to the working of this credit system.

SUGAR INDUSTRY.

EFFECT OF THE NEW AMERICAN TARIFF.

In the *International Sugar Journal* for October 1913, some surprise is expressed at the small amount of attention which the *Louisiana Planter* has given in recent issues to the impending catastrophe which sugar growers have to anticipate in America. Expectations are amply fulfilled, however, in the *Louisiana Planter* for October 11, 1913, where a large amount of space is devoted to the effect of the new tariff on the sugar industry. It is pointed out that the United States consumes nearly one-fourth of the sugar produced in the world. Consequently sugar legislation in the United States is regarded with extreme interest throughout the remainder of the sugar world. As is well known, all duties except the Dutch colour-standard duty will not be removed until March 1, 1914. The journal referred to above describes in the following words the effects which it will have upon sugar producers during the coming four and a half months.

'We can see that the first impulse given to sugar producers by the changed conditions would be to expedite the sale of the 600,000 tons of domestic beet sugar, which in order to receive the present protection of 1·348c. must be needed by consumers and must have passed into the hands of practical consumers by March 1, 1914, but four and a half months distant. Next will come the Louisiana crop, the marketing of which will begin about the first of November, which may add 300,000 tons to the beet crop sugar as stated, and then Hawaii will do what it can with its sugars during this short space of time, and Porto Rico will doubtless make strong efforts to begin its campaign early, and to carry it on with all possible rapidity to come within the limits of March 1. The aggregate of these four privileged crops, Louisiana, the domestic beet, Hawaii and Porto Rico, will reach one half of the annual consumption of the United States for the year, and its marketing through the next four months, based upon the present Dingley tariff rate, as reduced by the Cuban reciprocity, is a practical impossibility.'

Under the existing law, refined sugars in America are taxable at the rate of $1,000 a day protection to a sugar refinery turning out 4,000 barrels of sugar.

It may be added, further, that the Cuban sugar crop is expected to control American values, for this country can send in 96° test at a cent a lb. duty and pure white sugar at 1·09c. per lb. duty against 1·46c. per lb. duty under the existing system. In other words, Cuba can send in pure white sugar at less than one-tenth of a cent per lb. greater duty than 96° test.

Another article in the *Louisiana Planter* puts forward suggestions for meeting the changed condition in the sugar business in Louisiana. Great importance is attached to co-operative sale of white plantation sugar by the growers themselves. This sugar, it is stated, should be packed in 5 or 10 lb. cartons and advertized in most of the popular papers having a wide circulation. Similar action should be taken in regard to molasses. This should be packed in from 1 pint to 1 gallon tin cans, thoroughly advertised as 'Pure 'Louisiana Molasses'—without the addition of glucose made from corn.

RUBBER INDUSTRY.

QUALITY OF PARA RUBBER FROM VARIOUS PLACES.

A number of samples of Para rubber have lately been reported on in the *Bulletin of the Imperial Institute* (July-September 1913). These came from Ceylon, India, Southern Nigeria, British Guiana and Papua. The following is a summary of the report.

The samples from Ceylon consisted of a number of biscuits and represented rubber prepared from a row of trees tapped at intervals of one, two, three up to seven days respectively. A few of the biscuits were rather weak but, on the whole, good. Chemically, the rubber was of very good quality (96 per cent. caoutchouc), but it is of interest that the rubber obtained by tapping at intervals of three to seven days contained a little more caoutchouc than the rubber obtained by tapping every day or every other day.

The samples received from Burma showed considerable variation for plantation rubber. In general, the percentages of resin and protein were a little higher than is usual, and in these cases the amount of ash was excessive.

The Southern Nigerian biscuits were composed of well prepared smoked rubber, and possessed very good physical properties. The brokers report on these samples seems eminently satisfactory. The biscuits were classed as fair average quality and valued at about 4*s.* 10*d.* per ℔. in London, with fine hard Para at 4*s.* 10½*d.* per ℔, and smoked plantation sheet at 4*s.* 8*d.* to 4*s.* 11*d.* per ℔. It is stated that consignments of similar character would realize very good prices in the market. The difficulty at present is, of course, to say what is 'of similar character'.

BRITISH GUIANA.

A sample of Para rubber biscuits and one of scrap rubber were received from British Guiana. The biscuit rubber was rather weak, but considering the age of the trees (four and a half years, 18 inches girth 3 feet from ground), its physical properties must be regarded as quite satisfactory. The scrap rubber was also rather weak. Chemically, the biscuit was very good, but the scrap contained rather more resin, protein and ash, and consequently, the percentage of caoutchouc was lower. The biscuit rubber was valued at about 3*s.* per ℔. in London and the scrap rubber at about 2*s.* 6*d.* per ℔, with fair average quality plantation sheets or biscuits at 3*s.* 1½*d.* to 3*s.* 2½*d.* per ℔., and fine hard Para at 3*s.* 6½*d.* per ℔.

Hevea brasiliensis has only just come into bearing in the territory of Papua, but the report on samples of this rubber received at the Imperial Institute in November 1912 shows that Papua can produce rubber equal in quality to that of fine hard Para. The rubber was in the form of large thin sheets of pale brown colour; it was clean and very well prepared. The physical properties of the rubber were excellent, whilst analysis showed the quality to be exceedingly good also. Examined by brokers, this rubber was valued at 4*s.* per ℔. in London, with fine hard Para at 3*s.* 11*d.* per ℔., and average plantation sheets and biscuits at 3*s.* 10¾*d.* to 3*s.* 11¼*d.*

The prospects of the cultivation of *Hevea brasiliensis* in Papua, therefore, appear to be exceedingly promising.

VEGETABLE OILS.

PULZA OIL.

Under this name a considerable industry is carried on in the Cape de Verde Islands in the oil obtained from the seed of *Jatropha Curcas*, a Euphorbiaceous plant, commonly known throughout the West Indies as the Physic nut. According to information received from Kew, about 350,000 bushels of the seed are gathered and exported annually to Portugal where the oil extracted is called purqueira oil and is used principally for burning. In British commerce it is usually known as seed oil.

The expression of the oil is performed in the dry, on seed slightly crushed; 1,000 ℔. of seed gives 640 ℔. kernels which yield 260 ℔. of oil. The industry is carried on most extensively at Lisbon. The decorticated seed contains about 52 per cent. of this oil, which is a semi-drying oil and used for soap and candle making. The cake is unsuitable for cattle food but worth about £3 per ton (1904) as manure. The value during 1904 of the oil was £14, 5*s.* per ton (see *Bulletin of the Imperial Institute*, September 1904, pp. 170 to 171, also *ibid* 1912, p. 62). At the present time the price would be much higher.

In connexion with the value of the seeds as cattle food, attention has recently been drawn in the *Journal of the Board of Agriculture* (October 1913) to the occurrence of some cases of poisoning in Germany from the employment of the seeds of *Jatropha curcas*. The information in question refers to experiments both with the oil and seeds and reviews the cases of poisoning. The observations are summarized as follows: Curcas seeds contain (1) a poisonous agent, curcin, which has no effect on blood globules *in vitro*, but which does harm to blood vessels *in vivo* and, above all, probably has a toxic effect by lodging in important brain centres (in the same way as ricin); (2) curcas oil: the poisonous properties of this are due to curcanic acid produced in an analogous manner to crotonic acid. In consequence of its content of curcanic acid it is one of the strongest drastic substances known, and when curcas seeds are taken internally, the curcanic acid causes entero-gastritis both in man and animals.

The above information is believed to be of special interest in the West Indies in view of the wide distribution of *Jatropha curcas*. In conjunction with the production of other oils or oil-bearing vegetable matter like cotton seed, it might be found possible to develop a pulza oil industry in the West Indies. Further information on the subject will be given in the *Agricultural News* as it becomes available.

NOTE ON A LEMON GRASS OIL FROM FIJI.

A volatile oil has recently been distilled from a plant in Fiji identified at Kew as *Cymbopogon coloratus*, Stapf, a species which had not hitherto been used commercially for the production of volatile oil. The oil has the remarkable property, very unusual in an essential oil, of retaining its characteristic odour after the soap in the making of which it is used, has been kept for a considerable time.

It appears that in the 1913 experiments, 1,117 stools gave 2,988 ℔. of grass from which 10·01 ℔. of oil were obtained, or at the rate of 43·4 ℔. of oil per acre. The actual return per acre varies, but in Fiji the difference between the value of the oil obtained and the cost of distilling it should be at least £2 per acre per cutting. Two cuttings a year may be depended upon, whilst three may be made unless dry weather sets in for some time.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

Vol. XII. SATURDAY, NOVEMBER 22, 1913. No. 302.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with agricultural bias in the teaching of subjects other than science.

On page 373 will be found described an interesting piece of mechanism under the heading of A New Pump for Estate Work.

Under the general heading of Vegetable Oils, on page 375, appear two articles on pulza oil and lemon grass oil respectively.

Under the caption Book Shelf, on page 379, are reviewed two works relating to rubber planting and Indian corn cultivation respectively.

The first of a series of articles on field surveying is given under Students' Corner on page 381.

Insect and Fungus Notes contain, amongst other information, accounts of pests and diseases of sugar-cane and cotton in St. Croix.

Note on the Cacao and Coco-nut Markets.

Now that rubber has proved rather disappointing to its supporters of three or four years ago, there is some suggestion, according to *The World* (October 7, 1913,) of forming a market to deal in the shares of various companies producing coco-nuts and kindred material in Trinidad and some of the other West Indian Islands. It is claimed that in these districts the nuts grow to a larger size than in the East. It would seem, however, in view of the fact that the companies are small, that it would be difficult to create a free market in the shares. An encouraging feature attendant on the suggestion is the price of copra, which has risen 20 per cent. to £33 a ton.

In discussing the London cacao market recently, the editor of *Tropical Life* draws attention to certain remarks which have appeared in the *Tea and Coffee Trade Journal* of New York, in relation to the effect of the Reciprocity Treaty between Canada and the West Indies on Trinidad's cacao trade. As America is Trinidad's best customer for cacao, both as regards price and quality, any legislation that tends to discourage or break up that trade cannot be sympathized with. If Trinidad has to depend on Europe for the entire sale of her cacao crop, the market is made a very uncertain one, and prices will be likely to drop to the level of those for British West African.

The French and German Colonies and Agricultural Research.

'No problem', says *L'Expansion Colonial* (October 1, 1913), 'appears more grave, and demands solution more urgently than that of the scientific organization for the agricultural exploitation of our Colonies.' The writer (M. Emile Baillaud) believes that what is needed is the establishment in each French tropical possession of one or more experimental stations devoted entirely to the investigation of a single crop—the staple crop of each colony. Thus M. Baillaud asks 'why in Sénégal has not a station been established and devoted entirely to ground nuts—in Guinea one for rubber, one for fruit culture and one for kola—on the Ivory Coast, one for cacao (like that instituted with success on the Gold Coast)—in Dahomey, one for oil palms—in Gabon, one for cacao and coffee—in the Congo, one for rubber and thus in each colony for the principal cultivation?' French-grown cane sugar is produced principally in the older colonies (for instance Guadeloupe and Martinique) and here, it is urged, any success which accompanies this cultivation is largely due to the scientific work conducted in neighbouring colonies belonging to foreign Powers.

It would appear that, as regards Germany, the policy adopted in the organization of tropical agricultural research embraces principles very similar to those advocated by *L'Expansion Colonial.* Dr. Walter Busse, of the Imperial German Colonial Office, Berlin, writing in the *Bulletin of the Imperial Institute* (for July-September, 1913) refers to the work of the Biological-Agricultural Institute, Amani, and to the Kibongoto Agricultural Experiment Station. Here the work is of a general kind, but during the last three years special 'cotton stations' have been established for the advancement of cotton cultivation in the protectorate.

The Kameroon territory contains several cattle-breeding stations together with rubber and cacao inspectorate establishments. German south-west Africa possesses an experimental station for tobacco cultivation at Okahandja, one for tillage near Windhusk and farms for breeding sheep and ostriches respectively. Togoland possesses an institute of agriculture and several cotton stations, whilst for German New Guinea a coco-nut station, an animal breeding station and other establishments, are now definitely projected.

Position of the Rubber Plantation Industry.

On the assumption that the demand for rubber will increase 10 per cent. annually for the next ten years, Mr. W. F. de B. Maclaren (see *India Rubber Journal*, October 18, 1913), is able to put a brighter aspect on the present and future position of the industry. The justification for looking forward to this increased demand rests upon the fact that during the last three years—in spite of disturbances—the world's average annual increased consumption was at the rate of over 10 per cent. This was with rubber at about double present prices.

It is further argued that there will be years when there must be an acute scarcity of rubber. The regulation of supply, however, is a matter which in any event could be easily controlled by the growers, provided the companies decided to co-operate (see *Agricultural News*, Vol. XII, p. 342).

It does not seem, however, to follow necessarily, that because the annual increased consumption for the world has been 10 per cent., that the same rate of increase will occur in the future in any one part of it. It seems at any rate to be becoming clearer and clearer, that the problem of the supply and demand of plantation rubber must be regarded rather as an international question than one affecting merely London and the Federated Malay States.

Louisiana: Its Untold Treasures.

An interesting publication has just been received in the form of the *National Magazine* for February 1912, containing an account of all the natural resources, and of the improvements and the general progress that have been made in Louisiana during recent years. The distinctive feature of the publication is its excellent illustrations. Views are given of most of the principal cultivations which are of the most varied kind, also of the chief buildings in New Orleans (the great cotton port), and of the various factories connected with the sugar industry.

In the course of the descriptions it is pointed out that the essential feature of agriculture in Louisiana is diversification. In this scheme, wheat, potatoes, ground nuts, sugar-cane, citrus cultivation, cotton and rice each has its place. Considering the present position of the sugar industry in Louisiana and the uncertainty surrounding the cotton crop, a still higher diversification will in all probability be brought about in the near future.

The principal constructive work in Louisiana during recent years has been the reclamation of swampy land, and perhaps few countries in the world now possess a better system of water and railway transport than Louisiana. It may be added that the treasures of this State include large mines of sulphur and numerous oil fields.

Ground Nut Trade with Canada.

Reference has been made above to the pea nut cultivation in Louisiana. This forms an extremely interesting subject, in view of the fact that the Canadian demand for pea nuts is met very largely by the United States. The trade journals for the year indicate that the trade in pea nuts is steady and that the price for green and for roasted varies from 8½c. to 15c. per lb.

The reason for approaching this subject rests upon the circumstance that enquiries have been made at this Office by the Canadian and West Indian League as to the possibility of the West Indies exporting sufficiently large quantities of ground nuts to interest Canadian merchants. It is pointed out that there is a big demand for pea nuts in Canada, and the preference that Canada now gives the West Indies on this article should greatly stimulate the industry in these islands.

Studies in Indian Tobaccos.

The following general conclusions are drawn by Gabrielle L. C. Howard, at Pusa, in regard to her studies on the inheritance of characters in varieties of *Nicotiana tobaccum*, L:—

'The data obtained by a study of the characters of N. *tobaccum* show that there is no inherent difference in the mode of inheritance of ordinary qualitative characters (such as the colour of the corolla) and of those characters connected with the size of the organs which are subject to fluctuating variability. All the results obtained can be explained by the Mendelian assumption of segregation of characters, combined with the hypothesis, that in connexion with each character a large number of factors exist, each of which can be inherited independently. This conclusion is supported by the great range of variation in the F_2 generation, the formation of extreme forms in this generation far outside the limits of the parents, the differences and diminution in the range of variation in the F_3 cultures raised from different variates of the F_2 generation, and by the isolation in the F_3 and succeeding generations of forms like the parents, and also of intermediate forms which breed true. This isolation of new forms can easily be explained by a re-arrangement of the factors.'

A detailed account of the work is given in the author's paper published in the *Memoirs of the Department of Agriculture in India*, Vol. VI, No. 3, Botanical Series.

INSECT NOTES.

A PEST OF ORANGES.

The occurrence of a pest causing injury to oranges in Dominica, has recently been reported.

HISTORICAL.

This pest was first reported to this Department towards the end of 1907 when a few injured oranges were submitted for examination.

In 1908, a further bad attack was experienced, and an investigation of the conditions was made by the Acting Curator, who submitted a preliminary report on the habits of the insect and the nature of the injury. That officer also recommended certain remedial measures which were tried.

The Entomologist of this Department recommended an additional measure, viz., spraying with arsenate of lead, which was tried in 1909 with such satisfactory results that the pest was reported to be completely under control, and this satisfactory state of affairs was again reported in the following season (1910).

Since that time no record of the insect has been received at the Office of the Imperial Department until October of the present year.

THE INSECT.

The insect concerned in this attack is a small moth apparently of the family Tortricidae, but only a few specimens of the adult have yet been secured and its identity has not been established.

It would appear to be related to the codling moth (*Carpocapsa pomonella*), and to the Natal codling moth (*Enarmonia batrachopa*), both of which are Tortricids which injure fruits in a manner similar to that of the orange pest in Dominica.

HABITS OF THE INSECT.

From the reports of the agricultural officers in Dominica (the Acting Curator in 1908 and the Assistant Curator in 1913), it would appear that the attack begins in May or June, the egg being laid on the surface of the fruit, and the larva (a small caterpillar) penetrating through the rind into the interior of the orange. During August, the larval stage is completed and the full-grown caterpillar leaves the fruit (which by this time has fallen to the ground) and enters the pupal stage amongst the leaves on the ground. About two weeks later the moths emerge. What becomes of the insect during the period from about September or October to the following May or June is not known.

INJURY TO THE FRUIT.

The insect injures the fruit by penetrating the skin and living and feeding in the pulp of the orange. Often the characteristic puncture of the skin is seen, when on cutting open the fruit, no injury to the interior is found. It is likely that in such cases, the attack was begun on a very young fruit, in which the growth was so rapid as to prevent the development of the caterpillar.

In other instances, the larva successfully penetrates to the pulp where it feeds and completes its development, causing a portion of the pulp to become a discoloured, rotten mass. Even when no further injury is caused than the puncture of the skin, the fruit is rendered unsaleable, on account of the discoloration at the point of attack and the malformation which often results.

REMEDY.

Several remedial measures have been tried, the most successful of which appears to be arsenate of lead applied as a spray early in the season, in order that the newly hatched caterpillars may be poisoned as they attempt to eat their way through the orange skin.

CAUTION.

Growers of oranges who may observe appearances leading them to suspect the presence of this pest on their fruit should inform the local agricultural officers, forwarding specimens and asking for advice as to the treatment to be adopted.

INSECT PESTS AT ST. CROIX.

The Report of the Director of the Department of Agriculture, St. Croix (D.W.I.), for the year ended June 30, 1913, was reviewed in the previous number of the *Agricultural News* (see page 363) from the advance copy forwarded to the Imperial Commissioner. The portion relating to insect pests is briefly dealt with in the present and succeeding articles.

The chief insect pests recorded in this report are those which attack sugar-cane and cotton.

The most important pest of sugar-cane in St. Croix is the rhinoceros beetle (*Strategus titanus*), the larva of which attacks the roots of the growing plants, and tunnels its way into the stalks for a considerable distance. This insect has been mentioned in the *Agricultural News*, Vol. XI, p. 346, and Vol. XII, p. 170, where an account of its habits, life-history and distribution is to be found.

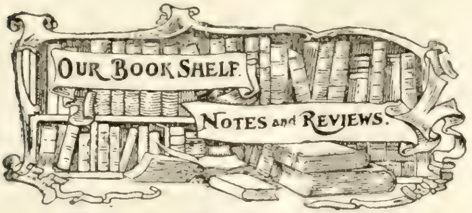
The grubs of the rhinoceros beetle usually live in decaying megass, but in certain years they have been a most serious pest of growing canes. A similar insect occurs also in Porto Rico.

The grubs are to be found abundantly in cattle pens and megass heaps, and when these exist in the cane fields, the badly attacked stools of cane appear to be dying of drought. If such stools are uprooted, grubs may be found among the roots and often in their large tunnels in the stalks. During the season under review these grubs have seriously attacked cane plants and young cane sprouts. In a portion of a field at the Experiment Station about 80 per cent. of the canes were destroyed.

A simple and effective remedy has been found in the use of a poisoned bait consisting of 100 parts by weight of fine megass and 3 parts of Paris green, thoroughly mixed together. This poison is used in the following manner: A hole is made with a drill beside each plant and a handful of the poisoned megass placed in it. After a few days the baits are examined, and large numbers of dead and dying grubs are found in and near to them. This treatment of badly infested fields has been found entirely successful. It is suggested that badly infested fields should be thrown out of canes for a season, the stumps dug out and burnt and a rotation crop—cotton—planted after careful preparation of the land. Between the rows of cotton the poisoned megass bait should be drilled in every 3 or 4 feet.

The pink mealy-bug is of fairly frequent occurrence, causing a considerable amount of damage to canes, especially the young canes. It attaches itself to the roots of these at the base of the stools and to the nodes just above ground. The remedy to be adopted is to use no cane for planting on which the mealy-bug occurs.

A summary of the observations on cotton and the remaining cane pests will appear in the next issue.


Our Book Shelf.
Notes and Reviews.

RUBBER AND RUBBER PLANTING. By R. H. Lock, Sc.D. *Cambridge University Press*, 1913.

In view of the fact that interest in the rubber industry has extended within recent years beyond a comparatively small section of the community directly connected with production and manufacture, Dr. Lock has attempted to present an introductory outline of our knowledge of rubber and rubber planting, in a form which is simple and yet comprehensive. The author has succeeded in doing this and more, for the work is one which should be of great practical use to those who contemplate entering the industry either at home or abroad.

In Chapter I, an account is given of the history of the use and cultivation of rubber, where interesting statistics relating to production will be found. In the next chapter the botanical sources of rubber are dealt with, and a useful description is given of the various latex producing species. Of particular interest in this chapter is the information relating to African and Asiatic rubbers, though the economic life of these species, it is feared, is gradually drawing to a close.

In dealing with the physiology of latex production, in Chapter III, a large amount of attention is devoted, as might be expected, to the laticiferous system. The subject-matter is supplemented with illustrations showing the breaking down of the lateral and transverse cell walls in *Hevea brasiliensis*. In describing tapping experiments, Dr. Lock brings together most of the reliable results on the subject. Wound response is dealt with first, followed by duration of yields. The relation of yields to volume of bark is a subject of particular interest, and it is shown that in all probability latex is formed by active secretion of latex in existing laticiferous tissues. Seasonal variation receives attention next, followed by an account of variation in the yield of different trees. It is important to bear in mind the author's remark that the selection of individual trees may be expected to play an important part in the future development of the rubber industry.

A large amount of information is given next concerning general considerations affecting tappings and yields, and a useful summary of the position is provided at the end of the chapter.

At the present day most of the easily accessible land for rubber has already been planted up, so that the author's remarks on planting operations, presented in Chapter V, should prove particularly helpful to those who intend bringing new land under cultivation. The subjects of clearing, nurseries, seed selection, drainage, irrigation, roads, spacing, weeding, intercrops, manuring and the like are dealt with in considerable detail.

In Chapter VI, which deals principally with the methods of tapping and the collection of the latex, Dr. Lock appears to be at his best, and information brought together on this branch of the subject constitutes a very valuable literary contribution.

The information relating to factory work on the estate deals principally with coagulation, washing, drying, smoking, etc. The facts presented in regard to coagulation seem to be rather limited in number, and some of the more recent work is apparently not incorporated in this section. The last three chapters deal respectively with pests and diseases of Hevea, the chemistry of India rubber, and the manufacture of rubber goods. The mycological information is principally composed of the results of Petch's work in Ceylon, whilst the chemical information incorporates the fundamental facts concerning synthetic rubber and the physical properties of caoutchouc. The inclusion in the final chapter of a description of the principal processes involved in the manufacture of rubber goods completes the intellectual journey; the reader having travelled from the wild territories of the Amazon to the plantation in the East; from the fields of the plantation to its factory; and from there to the large manufacturing establishments at home, where the raw material is tested and turned into marketable articles.

THE CORN CROP. By E. G. Montgomery. *The Macmillan Company*, New York, 1913.

Yields of Indian corn amounting to 200 bushels per acre have under optimum conditions been produced in the United States, though the average yield is, at present, about 26 bushels. Therefore the study of Indian corn should be directed towards those factors which hinder full development and thus limit production on the average farm; and it is from this point of view that this useful text-book deals with the subject. It should be added here, that the author does not confine himself to Indian corn alone, but devotes several chapters also to sweet corn and the sorghums (including broom corn).

The subject of plant adaptation is treated in a very instructive manner. The improvement of varieties by mass and pedigree selection, and by selection based on chemical composition is dealt with first, followed by directions for laying out experimental plots. All the information is essentially practical. The chapter on the results of hybridization deals with the crossing of biotypes and the application of Mendel's law, and the section concludes with an account of the manurial requirements of corn. The succeeding section deals with cultural methods, the principles of which apply to a certain extent in the Tropics

The preparations for planting the corn crops in the United States should (though do not always) include the 'ear testing' of the seed to be planted. A piece of wet cloth is divided by lines into square inches, and from each ear of corn intended for use as seed, six grains are taken. Every six grains is placed in a single square and the ears whose grain germinates quickest, bear the seed that should be used for planting.

In perusing Chapter XIX, concerning the harvesting of corn, we hoped to find rather more space devoted to the question of storing and drying of corn. Little is said on this subject, beyond the fact that large commercial driers are now in general use.

In regard to the export trade in Indian corn from the United States and other countries, a large number of interesting statistics are given. The exportation of corn from the United States is decreasing: it has fallen in ten years from 9·4 per cent. of the total crop to only 2·29 per cent. This decrease indicates that home consumption in the United States will soon equal production. Countries (e.g. the West Indies) which can grow corn but choose rather to import most of what they use from the United States, would do well to bear this in mind.

GLEANINGS.

During October the weather was very wet in St. Vincent. Sakellarides cotton was badly attacked by the angular leaf spot disease.

Some few acres of cotton were planted during September in the Virgin Islands, but owing to continued dry weather the peasants have in general delayed planting.

A meeting was held at Sauteurs in Grenada during October, at which it was resolved that a branch agricultural society should be formed in St. Patrick's parish.

In St. Kitts-Nevis the condition of the cotton and sugar-cane crops has greatly improved since the receipt of rain. The cotton crops in both islands appear to promise extremely well.

In Dominica the main lime crop was practically finished by the end of October. A very fair second crop is expected during December and January. The cacao crop is now commencing.

It is stated in *The Field* (October 4, 1913) that in certain parts of Ireland on the sea coast where fodder is scarce, the cows eat seaweed readily and appear to like it, although the quality of the milk is not improved on this diet.

A feature of the tea industry in Assam is the large amount of seed that is exported. One planter in Darrang is reported in the *Journal of the Royal Society of Arts*, October 10, 1913 to have exported 100 maunds of seed to Java last year.

Amongst the autumn lectures given at the New York Botanical Garden are two on Tropical Vegetable Foods by Dr. H. H. Rusby and the Uses and Characteristics of Palms by Dr. N. O. Britton, respectively. (*Journal of the New York Botanical Garden*, September 1913.)

The *Louisiana Planter* (October 4, 1913) refers to D.74 as a godsend to Demerara. This cane not only grows more tonnage per acre with a richer juice, but it is more resistant to cold and disease and insects and more suitable for syrup making than any other variety.

With reference to the article on dual-purpose cattle in Jamaica, in the last issue of the *Agricultural News*, it may interest readers to learn that the Red Poll breed has also been found to answer dual-purposes in Victoria. (See the *Journal of Department of Agriculture of Victoria*, September 1913.)

An instructive Bulletin (No. 82—Forest Service) entitled The Protection of Forests from Fire, has been received from the United States Department of Agriculture. It contains interesting illustrations showing the damage done by and the methods of preventing and fighting forest conflagrations.

The Turkestan and Trans-Caucasian cotton harvest at the commencement of September 1913 was more satisfactory than in previous years. As in past years the cotton cultivated in Turkestan has in most districts been chiefly, in some cases entirely, grown from American seed. (*The Board of Trade Journal*, October 16, 1913.)

According to the *Planters' Chronicle* (September 20, 1913) the total area of Ceylon is 25,331⅞ square miles and the population 4,106,350. In 1911, 1,359 acres were planted with coffee, 457,277 acres with tea and 184,551 acres with rubber. There are 7,592 Europeans in the island and of Indian families 301,400 men and 229,583 women.

Cotton cultivation is increasing in Siam. The growers are chiefly Chinese. Most of the cotton reaches Bangkok in an unginned state, hence the recent erection of a ginning plant and press will enable the cultivators to retain valuable seed which at present is largely lost. Freight charges will, of course, also be saved. (*The Board of Trade Journal*, October 9, 1913.)

An interesting report on copal from Mozambique appears in the *Agricultural Journal of the Companhia de Mozambique* (September 1912). The tree from which the copal is obtained has been identified at Kew as *Coparifera Gorskiana*, Benth. There appears to be a good demand in London for this class of resin, which should be readily saleable if properly cleaned and graded.

A notice appears in the Uganda *Government Gazette* (September 15, 1913) to the effect that the Agricultural Department in that Protectorate has for sale locally a large quantity of seeds and seedlings of ornamental fruit and timber trees. *Erythrina excelsa* is recommended for shading cacao and as a green manure; *Machelia Champaka* is recommended as very suitable for wind-breaks and timber. This tree attains height of about 20 feet in three years.

In connexion with the 'Demerara' sugar question, the *International Sugar Journal* says that Demerara should get the law established so that only sugar manufactured in British Guiana shall henceforth be classed as Demerara. It does not sympathize with the 'dyed imitation' accusation, especially when the imitation is a colonial product of probably equal quality.

STUDENTS' CORNER.

INFORMATION CONCERNING LAND MEASUREMENT.

In the measurement of land one of the first essentials is to possess a knowledge of the rules for determing the areas of simple rectilineal figures.

THE RECTANGLE AND PARALLELOGRAM.

It may be pointed out first of all, that it is very important for the student to remember the difference between the figures known respectively as a rectangle and a parallelogram. A parallelogram may be described in popular language as a rectangle pushed out of shape by the application of pressure at one corner. The area of a rectangle is obtained by multiplying together the length of two adjacent sides; the area of a parallelogram, on the other hand, is ascertained by multiplying the base by the perpendicular height.

RULES FOR COMPUTING THE AREA OF A TRIANGLE.

The most important figure with which the land surveyor has to deal, is the triangle. The area of this figure can be found by multiplying the base by one half the perpendicular height. There is a second rule, however, which is often useful when the tree sides of the triangle are given, namely: from half the sum of the three sides substract each side separately; multiply the half-sum and the three remainders together: the square root of the product will be the area. The area is always computed where possible by the first rule. In cases where it is required to find the area of an irregular rectilineal figure, all that is necessary in the case of, say, a four-sided figure, is to draw a diagonal, determine the areas of the two triangles thus formed, and add these two areas together.

THE SURVEYOR'S CHAIN AND ITS USE.

The measurement of land is generally done by means of a chain, a chain survey being one of the simplest kinds of survey work. A chain is 100 feet long and is divided into 100 links. In using the chain two assistants termed the 'leader' and 'follower' respectively are required; the leader takes the handle of the chain in his left hand and iron arrows in his right, and moves ahead while the follower remains at the starting point looking at the poles in front of him that have been set up to mark the lines to be measured, directing the leader into line by signs with his left hand They then move ahead and repeat the operation until the line across the field is measured. The figures are entered up in what is known as the field book.

MEASURING FLAT AND SLOPING GROUND.

The setting up of the poles to show the lines to be measured is based on the theory of triangulation, which will be dealt with in due course. Before proceeding to this subject it is necessary to explain the difference between measuring flat ground and sloping ground. The student will appreciate the importance of this part of the subject by considering what allowances he would make if he had to measure a field of provision crops or young cacao situated on the side of a hill or on very undulating ground, compared with a survey of a similar field on perfectly flat ground. A plan is a horizontal representation of the features of the ground. All measurements must therefore be reduced to a horizontal plane. Any undulations of the ground can be shown on what is known as a 'section', a term commonly used in connexion with levelling A plan is, therefore, not the actual surface of the ground, but the diminished quantity that would result were the whole projected on a horizontal plane. In rising or falling ground, the slope represents that side of a right-angled triangle opposite the right-angle, and is consequently of greater length than another side of the triangle, i.e., the horizontal distance. If the slope be not very steep, the horizontal measurements can be obtained by holding up horizontally, as nearly as can be judged by the eye, a part of the chain, say 25 links at a time, and allowing a pointed plummet to mark the measurements on the surface, this operation being continued until the undulating ground is measured. This method is known as 'stepping', and is recommended as being generally sufficiently accurate for small surveys. The steeper the slope, the less the length that can be measured by each holding up of the chain.

Another method is for the surveyor to judge the angle of slope, which is generally between 5 and 20 degrees, and to set back the arrow the number of links specified in a table which shows the necessary reduction. Sometimes the angle is determined with a clinometer or other angular instrument. In ordinary estate work, however, the 'stepping' method should suffice.

RESUME.

In the foregoing article the student will understand that the main object has been to lay down some of the first principles of out-of-door surface measurement, and to indicate as clearly as space will allow, the difference between measuring sloping land and flat land. Further information on the subject will be given in a future issue of the *Agricultural News*.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture returned to Barbados by the S.S. 'Korona' on November 15, 1913, from an official visit to St. Lucia.

In addition to matters of routine, attention was given to questions connected with the working of the lime juice factory which began operations on November 11. Réunion estate was visited in connexion with the Experiment Station and Land Settlement, together with Marquis estate where developments are taking place in regard to limes and cacao.

Mr. H. A. Ballou, M.Sc., Entomologist to the Department also returned by the same steamer after conducting investigations in Dominica.

Mr. P. H. Lamb, Director of Agriculture, Northern Nigeria; Mr. D. W. Scotland, Assistant Director of Agriculture, Sierra Leone; and Mr. R. Gill, an Assistant Superintendent of Agriculture, Southern Nigeria, arrived in Barbados by the R.M.S. 'Orotova' on Monday November 17, 1913, with the object of making official visits to this Office, previous to proceeding to other islands for the purpose of studying agricultural conditions in the West Indies.

FUNGUS NOTES.

PINK DISEASE.

A fungus causing a pink incrustation on cacao trees was described by Stockdale (*West Indian Bulletin*, Vol. IX, p. 178) as occurring in Dominica and St. Lucia; and South (*West Indian Bulletin*, Vol. XII, p. 293) recorded its occurrence on pigeon pea (*Cajanus indicus*) in the latter island. The fungus was identified at Kew as *Corticium lilacino-fuscum*, B. & C. Some forms of the disease known as thread blight have by various investigators also been ascribed to unidentified species of Corticium.

The closely similar pink disease of Hevea, tea, coffee, and a large number of other plants in Ceylon, Java and the Straits Settlements has long been the subject of investigation in the East. It is identified with *Corticium salmonicolor*, B. and Br., often referred to as *C. javanicum*, Zimm.

The results of a detailed study of the disease in Java by Dr. A. Rant, published in the *Bulletin of the Botanic Gardens*, Buitenzorg, Vol. IV, 1912, remove a great deal of confusion and carry our knowledge of the disease very considerably forward.

The disease is known by the Malayan name Djamoer oepas, and has been recorded on hosts numbering 141 species from 104 genera. Only two plants are mentioned as having proved to be immune. The present investigation has been mainly carried out with species of Cinchona.

Three forms of the disease have been supposed and are now proved to be due to the same fungus. In the typical form, the twigs are covered with a thin, continuous, pink incrustation, which later cracks in an irregular manner and turns yellow. The second form consists of a silky web, and is developed in damp situations. From the description it seems closely analogous to one type of thread blight as found in the West Indies. The third form takes the shape of small pink cushions formed in cracks in the bark. Further than this, a form which often accompanies pink disease, and which had been regarded as a distinct fungus under the name of *Necator decretus*, Massee, has also been proved to belong to the Corticium. It was first described as a disease of coffee trees from Singapore. It begins at the tips of the shoots and works backwards; the fructifications burst through the epidermis as minute rounded white pustules, which later change to an orange-red colour and a gelatinous consistency.

Perhaps the most interesting part of Rant's work lies in the experiments by means of which he investigated the possible occurrence of biological species. One of the greatest advances of modern mycology was made in the discovery that certain fungi regarded as identical though growing on different hosts were, in reality, so much specalized that they could only infect the particular species on which they were found. It is thus very important in a case where a fungus such as the Corticium in question occurs in morphologically identical forms on various host plants, to determine whether cross infections from one host to the others can take place. The results of the experiments established: (a) that all the examples of the fungus occurring in that neighbourhood belong to one biologic species (with one exception); (b) that so far as it has been tested the genus Corticium contains no biologic forms. The disease is thus shown to be transferable from one host to another without regard to difference of species, genus, or natural order. Even Gymnosperms, (e.g. *Thuja* sp.) are liable to attack. A lower degree of virulence appeared in experiments with material from other districts.

A considerable difference was found among individuals of the same species in liability to the disease. It was discovered that the principal factors influencing infection are the humidity of the air, the water content of the susceptible organs, and the amount of shade present. In laying out plantations attention should be given to the first named factor by having regard to the occurrence of fogs, and the amount of the rainfall. Close planting should be avoided. Insect attacks render plants more liable to the disease. The author recommends as the principal direct method of dealing with the disease, the cutting off and burning of the affected parts, especially the twigs. Burying them is insufficient, since they are liable to be brought to the surface again by cultivation and are then capable of serving as sources of infection. Fungicides are regarded as of little avail, owing to the presence of hyphae in the wood which are unaffected by their application. Carbolineum and Bordeaux mixture were both tried with little apparent effect. It should be noted here, that in a review of Rant's paper, Petch states that the prevention of attacks on Hevea by this fungus has been very successfully practised in Ceylon by means of sprayings with Bordeaux mixture just before the monsoon, the spores which have collected on the twigs and branches being killed as they germinate in response to the rain.

COTTON DISEASES IN ST. CROIX.

In the advance copy of the Report of the St. Croix Department of Agriculture by Dr. Longfield Smith, Superintendent of Agriculture, some particulars are given of two important diseases of cotton found in that island.

After mentioning angular leaf spot, round spot, cotton rust and mildew, the report states that a much more serious disease than these is caused by a fungus attacking the young and nearly mature bolls. 'The disease at first causes a pink discoloration of the boll, which later becomes black. If very young bolls are attacked they shrink up and remain on the plant without opening. Older bolls open sometimes at the tip only, and sometimes by a small slit in the middle of the boll. The lint of such bolls is discoloured and practically [spoiled?] and the seeds are also attacked and spores are commonly found on them.' These spores were examined by the late Mycologist of the Imperial Department (Mr. F. W. South) who reported them to belong to a Macrosporium, possibly *M. negricantum*, Atkinson, found on cotton leaves in the United States.

The second disease is one that was referred to in the Report of the St. Croix Department for 1911-12, and is described as causing the young leaves to assume a blistered and torn appearance, and the young flower to drop off when but the size of a pin's head. It occurs particularly where plants are overcrowded. and is more prevalent on moist soils. Its severity is such that unless the plant recovers it is usually entirely sterile.

Dr. Smith and the officers of his Department have been unable to trace the disease to any insect or fungoid parasite, and the present reviewer has examined preserved material with the same result. Dr. Smith is of opinion that the points of resemblance to a malady recently described in the U.S.A. under the name of Tomosis or Leaf Cut (O.F. Cook, Circular No. 120, Bureau of Plant Industry, U.S.D.A.) make it probable that the St. Croix disease is the same. The conclusion reached in the American investigation was that 'leaf cut is a disease only in a sense that frost bite, snow blindness and other environmental injuries are to be considered as diseases.'

But although the appearances produced are the same, there are, as pointed out by Dr. Smith, important differences in the incidence of the diseases in the two countries. Thus in the United States the disease is confined to seedlings and young plants, whereas in St. Croix it attacks cotton at almost all stages, while the American disease is favoured by conditions as regards close planting and soil moisture exactly opposite to those already mentioned for the St. Croix disease. In both countries the attacked plants frequently lose the disease in an abrupt manner.

Last year's recommendation to St. Croix growers to plant wider apart 'appears to have been followed with success, for there has been much less of the disease this season.'

Obviously there is much more to be learnt of both the St. Croix diseases, and the result of further investigations will be awaited with interest.

TOBACCO GROWING.

GROWING CIGAR WRAPPER TOBACCO IN SOUTH AFRICA.

The growing of tobacco of one class or another has been practised by the farmers of South Africa for many years, but it is only quite recently that organized attempts have been made to produce those delicate leaves which are used for wrapping cigars.

Cigar leaf tobacco is grown under cheese cloth shade in South Africa. The idea of growing tobacco under shade originated however, in Florida, where it was noticed that Sumatra tobacco grown near trees where it had been partly shaded was superior in quality to the rest of the field. Experiments were started, and in a few years the growing of cigar tobacco under artificial shade became an industry in itself.

Last year in South Africa (1912), with a poor season and with no irrigation there was produced with about 80 per cent., of a stand, 795 ℔. of cured leaf, and it may be said that splendid wrapper has been grown under shade, and even fair quality leaf in the open. During the present year, the crop consists of 1 acre under cheese cloth and 4 in the open. It is estimated that the crop will yield 1,000 ℔. per acre.

Sumatra varieties are the best for wrapper leaves, and the value of them lies in the thin but tough elastic leaf, the absence of any strongly marked taste or aroma, and the fine finished appearance it gives a cigar.

Turning to the question of cost, it is seen that the expense incurred in erecting an acre-tent consisting of cheese cloth, wire and wood posts is £41 9*s.* 3*d.*: this includes £35 13*s.* 7*d.* for material (one-fifth of the cost of supports and half of cost of cheese cloth), and £5 15*s.* 8*d.* for labour. These figures, of course, hold good only for Barberton, South Africa.

The usual care has to be exercised in the selection of soil, and in transplanting and cultivation. As regards topping and suckering, it is stated that if Sumatra tobacco is topped at all, it should be done just as the bud of the flower shows; then twenty to twenty-eight leaves should be left on each plant. About two weeks after this the suckers will have to be removed from the axle of the leaf. The latest approved method of producing fine wrapper tobacco, however, is to leave the tops on the plants. Harvesting is done by priming, i.e. picking off the leaves as they ripen from the bottom of the stock upwards. Picking should usually begin just after the plants come into flower. The proper condition in which to pick the leaves is told by the feeling and appearance of them. Exactness in determining the correct stage of ripeness is best acquired by experience, as all plants that are ready to harvest do not look alike; but, in general, the leaf will have a dull appearance and feel thick and leathery, sometimes showing faint yellowish flakes. These flakes are very characteristic on the top leaves, but are often indistinct on the lower ones, so that if we wait for them to become distinct before picking begins, the bottom and middle leaves will be over-ripe. The middle leaves of the plant are not thoroughly ripe until these flakes are developed, but the best wrappers are obtained by picking them a little under-ripe. The top leaves being small, are used for filler instead of wrapper, and should be allowed to get thoroughly ripe.

In curing leaf tobacco no exact rule can be laid down. The curing shed must have thorough ventilation and should not allow of too high a temperature inside. When green tobacco is first hung in the shade, the doors should be closed tight for three or four days until the leaves have yellowed. When this has happened the ventilators must be opened in order to permit the driving off of all surplus moisture. Sometimes it is necessary to increase the moisture in the shade by hanging up wet sacks. When all of the leaf except the midrib is cured, the shed may be opened during the day and closed at night. When the tobacco is fully cured it should be kept thoroughly dry and the shed kept tightly closed.

Other information is given, in the article from which this information has been taken (see *Agricultural Journal of the Union of South Africa* for September 1913), in connexion with curing, but, as previously stated, it is all largely a matter of local conditions and personal experience. In concluding it may be stated that the fermentation of cigar tobacco is not a process to be carried out by the planter, and therefore it is unnecessary to discuss this question in the present consideration of the production of cigar-wrapper tobacco.

Experiments with Tobacco Seed.—Recently efforts to get a quicker germination of the seed of beet roots and a stronger growth of the young shoots have been made with some success. The method adopted is to dry the young seed during twenty-four hours and at a temperature of 55° Celcius. The seeds do not suffer from root blight, whereas those that have been untreated are generally destroyed.

Similar experiments have lately been carried out with seed of Sumatra tobacco. Small quantities were dried during twenty-four hours at 50° Celcius in a dry air tube above unslaked lime, above calcium chloride, and lastly also above strong sulphuric acid. Equal quantities of the original samples were sown as controls. No quicker germination of the dried seeds could be noticed. The plots did not show any difference compared with the controls after seven, ten, fourteen and twenty days. Neither was it proved that the treated seeds can resist diseases, as part of the shoots grown from the treated seed was badly attacked by Phytophthora. It is believed that the beneficial effect of heating on the seed of beet root is due largely to its peculiar construction, which causes it to profit more by being well dried than tobacco can.

The above information is taken from some translations made by Mr. J. Heyligers, Chemist to the St. Kitts Central Sugar Factory, from *Mededeelingen van het Deli Proefstation.*

MARKET REPORTS.

London.—The West India Committee Circular, November 4, 1913; Messrs. E. A. de Pass & Co., October 24, 1913.

Arrowroot—2¾d. to 4¾d.
Balata—Sheet, 2/9; block, 2/1 per ℔.
Beeswax—£8 10s.
Cacao—Trinidad, 68/- to 76/- per cwt.; Grenada, 63/- to 69/-; Jamaica, 62/- to 68/.
Coffee—Jamaica, 55/- to 75/-.
Copra—West Indian, £32 per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 15d. to 21d.
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet, 36s. to 62s.
Isinglass—No quotations.
Honey—26s. to 36s. 6d.
Lime Juice—Raw, not in request; concentrated, £32 to £32 5s.; otto of limes (hand-pressed), 11/6.
Logwood—No quotations.
Mace—1/8 to 2/6.
Nutmegs—4½d. to 6½d.
Pimento—2$\frac{1}{16}$d. to 2⅛d.
Rubber—Para, fine hard, 3/1½; fine soft, 2/11; Castilloa, 1/8 per ℔.
Rum—Jamaica, 2/5 to 5/- per gallon.

New York.—Messrs Gillespie Bros. & Co., October 31, 1913.

Cacao—Caracas, 14½c. to 16c.; Grenada, 14c. to 14¼c; Trinidad, 14c. to 14½c.; Jamaica, 12½c. to 13½c.
Coco-nuts—Trinidad and Jamaica, selects, $40·00 to $42·00; culls, $25·00 to $26·00 per M.
Coffee—Jamaica, 11¼c. to 15½c. per ℔.
Ginger—8¾c. to 11¼c. per ℔.
Goat Skins—Jamaica, 48c.; Antigua and Barbados, 45c. to 48c.; St. Thomas and St. Kitts, 42c. to 44c. per ℔.
Grape Fruit—Jamaica, $3·25 to $4·25.
Limes—$4·50 to $6·00.
Mace—50c. to 56c. per ℔.
Nutmegs—110's, 12c.
Oranges—Jamaica, $1·50 to $2·50.
Pimento—4¼c. per ℔.
Sugar—Centrifugals, 96°, 3·42c. per ℔.; Muscovados, 89°, 2·92c.; Molasses, 89°, 2·67c. per ℔., all duty paid.

Trinidad,—Messrs. Gordon, Grant & Co., November 10, 1913.

Cacao—Venezuelan, $14·50 to $14·75; Trinidad, $14·10 to $14·35.
Coco-nut Oil—$1·20 per Imperial gallon.
Coffee—Venezuelan, 15c. per ℔.
Copra—$5·30 per 100 ℔.
Dhal—$4·70 to $4·90
Onions—$2·40 to $2·50 per 100 ℔.
Peas, Split—$6·00 to $6·25 per bag.
Potatoes—English, $1·60 to $2·00 per 100 ℔.
Rice—Yellow, $5·35 to $5·40; White, $4·90 to $4·95 per bag.
Sugar—American crushed, no quotations.

Barbados,—Messrs. James A. Lynch & Co., Ltd., November 15, 1913; Messrs. T. S. Garraway & Co., November 8, 1913.

Arrowroot—$5·25 to $6·50 per 100 ℔.
Cacao—$14·00 to $14·50 per 100 ℔.
Coco-nuts—$24·00.
Hay—$1·50 to $1·60 per 100 ℔.
Manures—Nitrate of soda, $70·00; Cacao manure, $50·00; Sulphate of ammonia, $82·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$2·25 to $2·75 per 100 ℔.
Peas, Split—$5·50 per bag of 210 ℔.; Canada, $4·00 to $4·10 per bag of 120 ℔.
Potatoes—Nova Scotia, $3·50 to $4·00 per 160 ℔.
Rice—Ballam, $5·25 to $5·40 per 190 ℔.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $4·00 per 100 ℔.

British Guiana.—Messrs. Wieting & Richter, November 8, 1913; Messrs. Sandbach, Parker & Co., November 7, 1913.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	5c. per ℔.	—
Balata—Venezuela block	No quotation	—
Demerara sheet	65c. per ℔.	—
Cacao—Native	12c. per ℔.	13c. per ℔.
Cassava—	60c.	—
Cassava Starch—	$4·00 to $5·00	—
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The Law of Diminishing Return.

UNDOUBTEDLY one of the most formidable forces that promoters of agricultural development have to contend with is the law of diminishing return. A concomitant of society even in its most primitive stages, this irrepressible economic tendency was the cause of Abraham's parting with Lot, of the invasion of Gaul, of the whole Western movement, exemplified in quite recent times by emigration to Canada and by the introduction of intensive systems of agriculture into the western United States.

In its widest application to agriculture this law lays down that the returns from the production of any particular produce shall diminish in proportion to the extension of area. In other words, the cost of production increases. The principle involved is that a certain crop can be grown in some places with a less expenditure of capital and labour than in others, and that the quantity of this favourable land is limited. Whence it follows that growers will first have recourse to the most fertile land, and afterwards to that which is less fertile.* A present day example of this is afforded by the extension of the area under plantation rubber, and to some extent by the results of efforts to extend cotton growing.

It is not always recognized that one of the principal aims of natural science at the present time is, so to speak, to hold in check this law of diminishing return by effecting improvements in the art of production. The raising of drought-resistant varieties, for instance, enables the cultivator of the less fertile land to overcome what is perhaps one of his main opposing factors; the immunization of domestic animals to trypanasome diseases assists the breeder in the Tropics to compete with the farmer in a cold country; whilst the introduction of labour-saving machinery allows of the remunerative investment of capital in land where previously it would have been prohibitive.

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* It should be pointed out that fertility in the economic sense is a relative term and really represents a chain of factors. When land is taken up in a new country for a new cultivation those who are in a hurry, reject the chain which has one or two weak links however strong the rest may be and select a lighter one that has no flaw. But if there is heavy work to be done, and they have time and the necessary knowledge and skill to make repairs, they will set the larger chain in order and then it will be stronger than the other. Lands which are first chosen do not *always* come to be regarded ultimately as the most fertile.

But even in natural science investigations themselves the law of diminishing return exerts an influence. To-day the most fertile fields have been well worked and are exhibiting signs of exhaustion. Agricultural research, like agricultural production, has been extensive rather than intensive, and with the same amount of mental effort less can be obtained to-day than could have been some fifty years ago. Scientific research is becoming a business, and an expensive business. Hence it is that the United States' expenditure on its Department of Agriculture has risen from $3,000,000 in 1898 to nearly $25,000,000 in 1913, and that for agricultural education and research in Great Britain, the State has voted £300,000 annually. Instead of a reduction in expenditure for purposes of research, it will be well to accustom ourselves at once to look forward in the future to a continual increase, if progress is to be maintained.

It will be convenient here to turn to quite another aspect of the law, namely its consideration in regard to the commercial investment of capital. Little reflection is necessary to see that in agriculture, the conditions surrounding the investment of money are diametrically opposite to those obtaining for commercial undertakings. In any productive business we may regard capital and labour as being applied in doses. In agriculture, the return to the first few doses is generally small and a greater number of doses may get a larger proportionate return; but sooner or later (assuming that there are no improvements in the art of production) a point will be reached after which any further dose will obtain a less proportionate return. It will be understood that the return to capital and labour of which the law speaks is measured in *amount* of produce raised independently of any changes that may meanwhile take place in the *price* of produce, though if we wish to draw deductions from the law, external conditions must of course be taken into account.

In the manufacturing industries the reverse occurs. Generally speaking, each successive dose of capital and labour brings in more than a proportionate return. In other words, the law of increasing return operates. If this tendency existed in the case of agriculture we should find cultivators giving up all but a very small plot of land and concentrating all their capital and labour on it. By so doing they would save nearly the whole of their rent

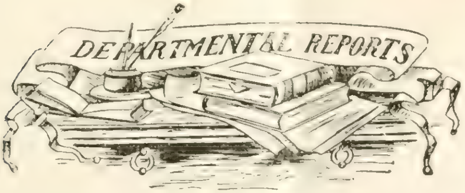
Strange to say, a widespread attempt to move in this direction is in operation at the present day. The concentration of capital in central factories and the organization of small holdings are really unconcious efforts to defeat the law of diminishing return.

The great work that has been done in Denmark and France in connexion with intensive agriculture and co-operation affords a striking example of this fact. There one finds capital and labour invested per acre that would be ruinous in Canada and Australia. In a country like Denmark we have what may be termed 'industrialized' agriculture, and the marginal dose of capital—to use a technical term—is farther removed from the first dose than is the case on larger properties in big countries where extensive rather than intensive agriculture prevails.

In the cultivation of land, the improvement of its natural productive value so that it will stand increased doses of capital is one thing, and the provision of this capital another. Moreover there is the question of labour. The greater the amount of capital expended per acre the greater will be the energy required to make it bring in a reasonable rate of interest. Both these requirements are met in a well organized community of small holders where systems of co-operative sale and credit exist, and where each man is interestedly industrious. Under these conditions the law of diminishing returns is strained to the utmost.

At the other extreme we have central factories. These render it possible for the growers to cultivate on a more intensive scale and less fertile land than would be the case if each had to expend time and money upon manufacture and transport individually. With the concentration of every effort on to the land itself, the optimum conditions are obtained for the remunerative investment of capital. Under the most favourable agricultural conditions however, the investment of capital is always limited by the law of diminishing return; but such capital has the advantage of being generally safer than much larger sums that may be sunk in purely commercial concerns, the success of which are frequently dependent upon agricultural supply, and upon the integrity and the personalities of those who are responsible for its management.

According to Mr. J. R. Jackson's report on the London drug and spice market (see p. 399 of this issue), the month of October opened with a generally depressing tone, which has continued throughout the entire month. The sales have been uninteresting, and prices show but very little change from those of last month, the only exception being an increase in the price of native Jamaica Sarsaparilla, and a decrease in that of Grey Jamaica.



GRENADA: REPORT ON THE AGRICULTURAL DEPARTMENT, 1912-13.

This publication really consists of five separate reports written by the officers in charge of the work which is summarized. Reference to the numerous matters dealt with is facilitated by the provision of a table of contents on the first page, and by the introduction of general subject headings, which are inserted immediately under the numbers at the top of each page.

EXPERIMENTAL WORK WITH CACAO.

The general administration report which constitutes the first section of the publication, provides, as its title implies, a general review of the organization and of the work done and contemplated by the Department as a whole. A commencement has been made in regard to experimental work with cacao. Manurial experiments started comprise series to test the effects of different nitrogenous manures sulphate of potash, basic slag and mulch. Spraying experiments have also been carried out. Two points were involved in this latter line of work: (1) the poisoning of epiphytic growths on the trunks of cacao trees in wet districts, and (2) the lessening of fungoid diseases of the fruit and bark. Copper sulphate solution was used in the first instance and Bordeaux mixture in the second. The results of the trials with Bordeaux mixture do not afford reason to believe that the method will be of much value in Grenada unless fungoid diseases become more prevalent. As regards the use of copper sulphate solution, it was found that the application of ½-gallon per tree was efficacious in killing all epiphytic growth.

Besides these experiments, others have been arranged with the object of selecting desirable types of cacao. There are now about twenty-four trees marked out for this line of work, and this year (1913) a definite beginning will be made.

After giving interesting information in regard to the improvement of Indian corn, the suitability of varieties of sugar-cane, and trials with cotton, limes, coco-nuts and other crops, the section concludes with a list of scale insects attacking cultivated plants in Grenada

WORK IN THE LABORATORY.

The report on the laboratory shows that attention has been mainly directed towards a soil survey, and a large number of physical analyses of different soils and subsoils are given. Grenada soils may be divided for practical purposes into red, black, and grey soils. The red soils have a high percentage of silt and fine silt. In the black soils the proportion of sand is much greater, whilst in the grey a high percentage of coarse sand occurs. As might be expected, the 'heaviness' of the soils decreases in the order in which the soils have just been referred to. The report also gives results of experiments on shrinkage and friability of soils. Future investigations will be conducted to extend the results of the different analyses, and to deal with specific cases of soil fertility or poverty.

WORK IN THE BOTANIC GARDENS.

A notable feature of the list of plants distributed from the Botanic Gardens presented in the next report, is the diversity of the various species sent out. This reflects the interesting nature, and therefore the educational value, of the garden, whilst economically it shows that efforts are being made towards the diversification of agriculture of the smaller estates. Large numbers of cane plants and coco-nuts were sent out. The former constitutes the staple crop on most of the settlements, and it is satisfactory to learn that coco-nut planting is being taken up not only by the larger landed proprietors but also by peasant holders as well.

EFFORTS IN CONNEXION WITH PEASANT INSTRUCTION.

This section of the publication is principally of local concern, though the notes on peasant agriculture present points of general interest and indicate the difficulties which the agricultural officers in Grenada are endeavouring to overcome. The greater portion of this report (seventeen pages) is devoted to the presentation of results of the judging of the Prize-holdings Scheme. These results show, on the whole, that the usual lassitude exists amongst the peasants. Improvements are required in connexion with drainage, the conservation of manure and the provision of the wind-breaks. Efforts have been, and continue to be made to awaken the holders to these facts. It may be stated that there are indications that the Prize-holdings Scheme will continue to increase in popularity and effect, particularly in the case of crops other than cacao.

REPORT ON LAND SETTLEMENTS.

Readers will be familiar with the circumstance that Land Settlement now forms an essential feature of the agriculture throughout the entire Windward Islands. The existence of small holdings has made it necessary to retain amongst them an area which may be devoted by the Agricultural Department to demonstration work and experiments. By means of these plots it is possible to bring about more easily, the introduction of a diversified system of cropping on the holdings, and to enable the Department to provide for the allottees selected seed and other planting material. Amongst those crops dealt with experimentally at these stations are sugar-cane varieties (of which B.147 has proved itself to be very generally suitable), cotton, tobacco, Indian corn, coco-nuts, pine-apples, fruit trees and ground provisions. It is satisfactory to observe from a table given at the end of the report, that the class of persons purchasing allotments in the Land Settlement districts during 1912-13 were principally agricultural labourers.

FOREST RESERVES.

A short account is given at the end of the publication of the work done on the Forest Reserve. During the year these areas have been increased. It is also interesting to note that on some of this land Para and Castilloa trees have been planted. The essential aim of these Reserves is to maintain forest conditions around the sources of the two streams from which the island's water-supply is principally obtained. Two rangers were employed during the year under the Land Officer to prevent squatting and the cutting of wood. For a full account of forestry conditions in Grenada, see *West Indian Bulletin*, Vol. XIII, No. 4.

Appended to the publication are monthly returns of the rainfall for 1912-13 at fourteen different stations situated in various parts of the island.

FRUIT AND FRUIT TREES.

NEW CITRUS TREES FROM CHINA.

One of the most remarkable of the wild species of the genus Citrus is definitely described for the first time in the *Journal of Agricultural Research*, Vol. I, No. 1.

The reader may remember that the question of wild citrus species was dealt with in the last issue of the *Agricultural News*, and the present account forms therefore, an interesting and important continuation of the subject.

The species under consideration has been named *Citrus Ichangensis*, Swingle. As far as is known, this plant is native farther north than any other evergreen species of citrus, only the deciduous *C. trifoliata* having a more northerly range. Besides having the most northerly range of any known evergreen species of citrus, it occurs at the highest altitudes reported for any other wild species of the genus.

C. Ichangensis is cultivated in China in the vicinity of Ichang; and it bears a very large lemon-like fruit that is of sufficiently good quality to cause it to be shipped to markets several hundred miles distant.

In the space of this article it would not be possible to reproduce in full Swingle's description of the species, but it may be noted that the species differs from its congeners in having very large thick seeds and slender leaves four to six times longer than broad, with very large winged petioles often as large or larger than the blade. It differs from *Citrus histrix*, DC., in having oblong rather than triangular winged petioles and much larger flowers with conate stamens. The bulky seeds of *Citrus Ichangensis* with their large brown caps and thickly formed cotyledons are not at all unlike those of the African species of hard-shelled citrus fruits belonging to the genera Balsamo-citrus and Aeglopsis.

A wild species of citrus collected by Hooker and Thompson in 1850 amongst the Khasi hills in Assam has been described by Swingle as a sub-species, namely, *Citrus Ichangensis latipes*, Swingle. It differs from *C. Ichangensis* in having the leaves more variable in size and shape with the tips acute, not caudate, the flowers in few-flowered (three to five) panicles instead of solitary, and the fruits oblate instead of prolate spheroidal in shape. The fact that Hooker and Thompson called this plant a wild orange is additional evidence that the lemon-like appearance of the Chinese form is a constant sub-specific character.

POSSIBLE USES OF THE SPECIES.

The large size of the seeds makes it probable that *Citrus Ichangensis* will produce very vigorous seedlings, and hence it is likely to be of value as a stock on which to graft other citrus fruits. The numerous large seeds, however, possess the drawback of greatly reducing the proportion of juice because of the space they take up. Since the plant is a native of China and Assam and very hardy, its suitability for growth in the Southern States is practically a foregone conclusion, and there is every probability that this species will play a great part in the development of citrus cultivation in America. In conclusion it may be pointed out that the discovery of *C. Ichangensis* in a part of China as accessible as Ichang is a further proof of the rich harvest of new species of plants that awaits the botanist and agriculturist in China.

In connexion with the above account, attention may be called to an article in the *American Breeders' Magazine* (July-September 1913) dealing with *Cudrinia tricuspidata*, a representative of the natural order Moraceae, and recently introduced to the United States from China. Its fruit, although small, is sweet and edible, and because of its hardiness, the shrub can probably be grown in the southern half of the United States. In China, the leaves are used for feeding silk worms at times when mulberry leaves are scarce. It is believed that it might be usefully employed for hedge purposes, and there appears to be little doubt that the fruit if successfully crossed with the Osage orange will provide a progeny yielding produce of great value as food for live stock.

DIFFERENT LIGHT INTENSITIES AND PLANT ASSIMILATION.

Although the subjects used in these experiments did not comprise tropical fruit trees, the importance of the results seems to be sufficiently general to justify their consideration on this page. The significance of the results in relation to tropical seedlings raised under shade and in regard to shade-grown cacao should be noted.

The subjects of the research were *Teucrium scorodonia* and *Pisum sativum*, chosen as being typical shade and sun-loving plants respectively. The various light intensities were obtained by using shelters covered with woven material of different textures. Amongst the conclusions drawn were the following: (1) that a leaf developed in shade can exhibit a higher stimulating energy in direct sunlight than a leaf developed in sunlight (this is attributed to increased chlorophyll content); (2) plants developed in full light are at great disadvantage when transferred to shade compared with those developed in the shade (this emphasizes the modifications which the shaded plants undergo); (3) plants developed in low light-intensity increase their energy when transferred to sunlight; (4) when the light-intensity is reduced to one-ninth, the assimilating energy is very low, and the adaptation has been carried to such a point that the leaf is unable to profit by increased illuminations when placed in direct sunlight; (5) an analogous effect is obtained when young plants are transferred to increased light-intensity, and it is probably due partly to lack of protective tissues and partly to deeper causes depending upon the activity of the protoplasm itself.

In general, plants seem to have the power of modifying their structure and chlorophyll content within their individual limits of adaptability, so that under natural conditions, their assimilating power tends to remain constant through the different light intensities.

Grafted Papaw as an Annual Fruit Tree.—According to the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (July 1913), the cultivation of this fruit in Florida has been impeded by the fact that its propagation from seed gives very uncertain results, while its propagation from cuttings is too slow to prove remunerative. A successful attempt has been made in grafting desirable stock on young seedlings, so that a yield of 48 to 72 lb. per tree may be obtained in fifteen months. There are indications that the demand for papaws is growing, and that the smaller fruits can be shipped to different markets with success.

To encourage coco nut cultivation an enactment has been passed in Kedah to allow of the remission of land tax under certain circumstances. (See *Agricultural Bulletin*, F.M.S., October 1913.)

SUGAR INDUSTRY.

SUGAR-CANE EXPERIMENTS IN BARBADOS, 1911-13.

A copy has just been received of the Pamphlet on the results of the experiments conducted with sugar-cane by the Local Department of Agriculture, Barbados, during the season 1911-13. During the course of this period very unfavourable weather was experienced, which resulted in an irregularity amongst the young canes and a reduction in the yield of sugar considerably below the average.

For the season under review, in the black soil districts, the average yield of White Transparent was 4,151 lb. of muscovado sugar per acre. Of the selected varieties, the seedling cane B.6308 came first with a yield of 5,974 lb. of muscovado sugar, giving an increase monetary yield of $29·72 per acre. B.18208 came next with 5,421 lb. of muscovado sugar, resulting in a monetary gain of $20·70 per acre over that yielded by White Transparent. Turning to the experiments on the red soils, White Transparent as plant canes gave an average yield of 4,714 lb. of muscovado sugar per acre. Amongst the seedling canes, B.6450 gave a yield of 7,466 lb. of muscovado per acre—an increased return compared with White Transparent of 2,752 lb. equal in value to $44·86 per acre. B.4934 came next with an increased value of $22·20, whilst B.3922 came third. On the red soils as plants, first and second ratoons grown during the season under review, White Transparent gave 12,796 lb. of muscovado sugar worth at $1·63 per 100 lb., $208·57 for the three crops. B.3922 gave 18,713 lb. of muscovado sugar —an increase of 5,917 lb. worth for the three crops $96·45 more than White Transparent. B.6450 came next with an increase worth $69·85 more than White Transparent.

Of the 2,334 seedling canes which were planted in 1911, seventy-four from their field characters and the richness and purity of their juice passed the year's standard and will be replanted at the close of 1913.

MANURIAL EXPERIMENTS.

These experiments were directed as in former years to ascertain the effect upon the industrial yield of the sugar-cane, the application of farmyard manure in ordinary quantity, and in double the ordinary quantity, and in varying quantities of nitrogen, phosphoric acid and potash contained in the usual commercial fertilizers. As already mentioned, the weather conditions were very unfavourable for the development of sugar-cane, and the results obtained in the manurial plots clearly indicate that the want of rain has been the limiting factor in the regulation of the results. The best monetary result in the nitrogen series was obtained where 60 lb. of nitrogen as dried blood was applied, all in January. A net gain of $7·54 was obtained. The next highest yield was obtained where only phosphates and potash were applied. This was followed by the plot to which 40 lb. of nitrogen as dried blood was applied, 15 lb. in January and 25 lb. in June. The application of sulphate of ammonia had a distinctly depressing effect.

In considering these results financially with those for the last twenty years, it is interesting to note that in the nitrogen series for the longer period, the best monetary results were obtained where 40 lb. of nitrogen as sulphate of ammonia was applied, 15 lb. in January and 25lb. in June. The next best result was obtained from the divided application of dried blood. As regards the phosphate series, there has always been a lower yield in all the plots to which phosphate has been applied than in the no-phosphate plot with the exception of the plot to which 100 lb. of basic slag has been applied per acre. In the potash series, in all the plots, with the exception of the one to which 60 lb. of potash as sulphate of potash was applied, all in January, there was an increase varying in the case of the no-manure plot from $2·75 to $9·94, and in the case of the no-potash plot from 56c. to $5·13 per annum.

As the superphosphate of lime plots have given a loss on the average for the twenty years during which the experiments have been carried out, and also as the dried blood plots have apparently given better results during the last few years than they did at first, it was deemed desirable to compare the average return of the first ten years with those of the second ten years, with a few to ascertaining whether the no-phosphate plots give now any indication of requiring phosphates. It would appear that this is not the case, since for the first ten years the yield on the no-phosphate plot was, on the average, 7,820 lb. of sucrose per acre, whilst in the second ten years the yield was 8,233 lb.—a difference in favour of the second period of 413 lb. of sucrose per acre. That this increase cannot be due to rainfall conditions is shown by the fact that the average precipitation per annum for the first ten years was 69·58 inches compared with that of the second ten years, which was 56·32 inches. The increased yield has therefore been due, most probably, to the regularity in the application of farmyard manure, and to thorough tillage. That this is likely is seen from the fact that the no-manure plots gave during the second ten years 4·73 lb. of sucrose per acre more than was yielded during the first ten years. It should be understood that these experiments were conducted on identical plots.

Further information is given in this report in regard to special experiments with sulphate of ammonia, nitrate of soda, nitrate of lime and calcium cyanamide. Want of space prevents reference to these, and to the large amount of other interesting information but barely touched upon in this review. In concluding, however, it may prove generally interesting to refer briefly to the facts recorded in the report in regard to the range of probable error in the experiments. The yields of four similar control plots were compared. The difference between the yield of the plot which was highest and that which was lowest amounted this year to 1,624 lb. of sucrose per acre—a difference of 31 per cent. Further, a difference between the highest yield and the average of the four plots was + 15·39 per cent. and between the average yield of the four plots and the lowest − 11·69 per cent. Reference to most of the tables of varieties for 1913 will show that this difference of 1,624 lb. corresponds to the difference in the yield given by the lowest variety and that occupying perhaps the tenth position in a list of fourteen canes. It would appear, therefore, that for the first year most of the results in each table of selected varieties, fall within the range of experimental error.

Too much importance must not, therefore, be attached to the individual monetary gains, and it would seem safer to regard the list of seedlings in each table rather as a group of promising varieties, and not to compare too closely the plants individually, at least from the grower's point of view.

At the end of the report the extension of the area under B.6450 is commented upon, and it is stated that the average increased value to the island in the near future from the cultivation of this cane should not be less than £100,000 per annum.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date November 17, with reference to the sales of West Indian Sea Island cotton:—

Since our last report about 200 bales of West Indian Sea Island cotton have been sold; these include about 130 bales Stains and Hybrids 8*d.* to 9*d.*, the remainder being New Crop St. Kitts and Nevis 17*d.* to 19*d.*

The market is nominally steady, but spinners have considerable stocks from last season and are not eager to purchase.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending November 15, is as follows:—

The market has remained quiet and unchanged throughout the week. The sales consisted of 100 bales, Extra Fine at 26c. and about 100 bales Fully Fine off in preparation at 20½c. The stock now largely consists of Fine and Fully Fine, which Factors are continuing to hold for their previous asking prices, but on actual bids would probably consent to make some concessions to sell. In the meanwhile we have only to renew our last quotations.

We quote, viz.,

Extra Fine	26c.	=	14¾*d.*	c.i.f., & 5 per cent.
Fully Fine	24c.	=	13¾*d.*	„ „ „ „
Fine 22c. to	23c.	=	12¾d. to 13¼*d.*	„ „ „ „
Fully Fine off in preparation	20½c.	=	12*d.*	„ „ „ „

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre up to November 15, 1913, were 3,220 bales, 3,672 bales, and 1,662 bales, respectively.

BRITISH COTTON GROWING ASSOCIATION AND AUSTRALIA.

As a result of enquiries made by the Dominion Royal Commission as to the possibilities of cotton growing in Australia and subsequent correspondence and a conference between members of the commission and representatives of the British Cotton Growing Association, the Government of the Commonwealth of Australia, the Government of Queensland and the Imperial Institute, a letter on the subject was sent recently by the Chairman of the Association to the Dominions Royal Commission.

The letter mentions first how anxious and willing the Association is to prove definitely whether cotton can be grown on a commercial basis in any part of Australia. It is pointed out, however, that in regard to their supplying a large sum of money for the necessary experimental work, the fact that the Association has already spent over £170,000 on such work prevents their being able to afford to devote any large sum of money towards carrying out the work under immediate consideration. It is suggested to the Queensland Government that in the first instance an agriculturist with good practical knowledge of cotton growing should be engaged for a period of three years, and he might with advantage be attached to one of the local Agricultural Departments. He should conduct experiments preferably on experimental plots situated on estates. This is often done in the United States and in Egypt, and it is generally arranged that the farmer shall be guaranteed a minimum crop. To assist in these experiments, the Association would contribute the sum of £100 per annum towards their cost, for a period of three years, dating from July 1, 1914.

It is essential to recognize that the question of the seed which is to be used for sowing is the most vital factor. 'No matter how good the soil, or how favourable the climatic conditions, or how excellent the cultivation, unless the seed is sound and well matured and of a variety suitable to the district, the result must be failure.' The danger of growing several varieties in one district is also pointed out. For example, if cotton 1½ inches long and worth, say, 10*d.* a pound, is mixed with cotton 1 inch in length and worth, say, 7*d.* a pound, it is probable that its value will be less than 6½*d.* per ℔. For this reason, amongst many others of equal importance, it is urged that the seed supply should be left in the hands of the Government, and that no one should be allowed either to import or distribute seed except under license from the Government. Further, the ginning and the baling of the cotton should be under Government control, for it is just as dangerous to mix different growths together in the ginning and baling as it is to so mix the seed.

As regards the type of cotton which should be cultivated, only experience will enable one to decide definitely which type will be most suitable. Sea Island and perennial cotton are to be ruled out at once. Indian cotton is of very low value and would be useless. Egyptian does well under irrigation, but is hardly to be recommended as a rain crop. As regards American, the shorter staple varieties owing to their low value are not likely to prove profitable. It must be remembered that although it has been proved experimentally that cotton can be grown in Queensland, the legislation against the importation of black labour makes the scale of wages so high that it is necessary to grow only the best types of high value, if the cultivation is to be a success commercially. It would therefore appear that some of the high class varieties of American Upland cotton would be most likely to answer purposes in Queensland.

After consideration of the whole question, the committee of the Association authorized the followimg offer to the Commission :—

As already stated £100 per annum will be contributed if the Government decide to undertake the experimental work suggested above. The Association will also supply, free of charge, small quantities of seed for experimental purposes; they will report on samples, superintend sales, keep separate accounts for each shipper and superintend the remittance of the proceeds. As well as this, the Association will pay the ocean freight, and will superintend the insurance of the cotton; the Association will, when required, make arrangements for financing cotton or seed by accepting bills drawn on shipment. The Association will furthermore supply ginning and other machinery, baling material and other stores on easy terms of payment, and will give the buyer full advantage of all cash and trade discounts. Finally the Association will guarantee a minimum price for Australian cotton in Liverpool or London of 6½*d.* per ℔., less insurance, port and other charges, (which amount to about ½*d.* per ℔.) for all cotton forwarded to them for sale and which shall have been produced from an annual variety grown from seed issued by the Government, and which shall be shipped in a clean and merchantable condition. Any surplus which may be obtained over the above mentioned price of 6½*d.* per ℔., will be remitted to the planter. It is stipulated that this offer does not apply to any cotton grown from perennial varieties, or from ratooned cotton.

LIVE STOCK NOTES.

THE GREVY ZEBRA AS A DOMESTIC ANIMAL.

The Grevy zebra (*Equus Grevii*) is one of the largest of the zebras, measuring between 13 and 14 hands and weighing about 800 to 900 ℔. at maturity. It is also by far the handsomest of its kind, having striking markings and a great deal of 'finish'.

This zebra inhabits the highlands of Abyssinia and Somaliland, and is apparently comparatively rare.

How the United States Department of Agriculture came in 1904 to direct their attentions towards the possibility of its domestication and hybridization, and the interesting results of the work which was subsequently taken up, are described in a paper by G. M. Rommel, Chief of the Animal Husbandry Division of the Department, published in the *American Breeders' Magazine* (July-September 1913).

Having obtained one of these animals in 1904, an attempt was made in the following year to cross it direct with mares, but without results. In fact the zebra evinced a positive aversion to mares, even his own size, and when turned out with one of them in the same paddock rushed at the mare and would undoubtedly have killed her had he not been driven back. The Bureau reached the conclusion that a zebra was like a jack, and if he had not been raised with horses might show some disinclination to mate with mares, or even refuse to do so at all.

Therefore the Department decided to establish a stud of zebras. But misfortune dogged their tracts; for of the four female zebras imported, three died, and the remaining one when bred to the first jack-zebra—named Dan—gave birth to a dead foal.

Along with the first female imported in 1907 another jack-zebra was brought. This animal was named Jerry. Jerry had been kept away from the female zebra and out of her sight as much as possible. He was a young animal when received, and it was thought that he had probably never covered a female zebra and would therefore be more likely to cover a mare. He was tested. Strangely enough he did not show any of Dan's antipathy to mares; in fact they all became very good friends, but no mating resulted. It was a platonic friendship. The mares came in heat regularly and Jerry manifested a certain amount of sexual excitement; he would mount but, for some peculiar reason, would not complete the act.

After some months of these trials without results, the female zebra was bred to Jerry. Whether this would cause him to refuse to cover asses was of little consequence, as the chance of getting a zebra foal could not be lost. The female was bred; and Jerry was then tried on the asses: strange to say, he covered them without objection. 'Why Jerry should refuse to cover mares when he had probably never mated with his own species, but would readily go to asses after he had mated with a female Grevy zebra, is a question in animal psychology the writer does not presume to answer.'

Copulation being readily performed by the zebra with female donkeys (though in the case of Dan only in seclusion), it was of course easy to collect semen to impregnate mares artificially. A female hybrid was foaled in June 1912.

It has been found that the zebra semen does not contain relatively so many spermatazoa as that of the stallion, and this may account for much of the difficulty that was experienced in breeding by artificial means.

The mare-hybrid is described as being more like a horse in appearance and manners; whereas the ass-hybrids resemble the donkey and are excessively stubborn. The mare-hybrid has the alert, spirited air of a mule, which one would expect from a high-spirited, well-bred mare. In breeding mules from jacks one depends on the mare for finish and quality. With the Grevy zebra one gets it from the sire as well. Therefore it would appear possible to breed a finer class of mule from the Grevy zebra than from jacks, using mares of poor as well as of superior quality.

In conclusion the author states that in these experiments it was found possible to confirm Ewart's classic experiments with the Burchell zebra, in Scotland, in regard to the much-discussed question of telegony: The influence of one impregnation of a female has little, if any effect, on the characteristics of subsequent progeny.

EUROPEAN ANIMALS IN BRAZIL.

The essential factors which have to be considered in the acclimatization of imported domestic animals in hot countries is discussed very thoroughly in a paper recently issued by L' Association Scientifique International d' Agronomie Coloniale et Tropicale. The paper deals more particularly with the question of acclimatization in the State of São Paulo, Brazil. The climate of this State is sub-tropical. The mean annual temperature is 17·7° C. with a maximum in summer of 38° C., and a minimum in winter (restricted to only one or two districts) of 1 to 2 degrees below zero.

The native races of animals which occur in this country are not, strictly speaking, indigenous, but are the descendants of imported animals brought by the early Portuguese colonists.

Although the State is well adapted for cattle grazing, it is essentially a pig country. As in the case of the other classes of live stock, the pigs are descended from Portuguese breeds and are characterized by a perfect adaptation to climate. They differ from European races in that they are thinner and therefore more suited for thriving in a hot country.

Turning now to the main subject of the paper, the author divides the factors of acclimatization into two groups: (1) meteorological factors—temperature, humidity, electrical conditions, light-intensity, wind; and (2) biological factors—vegetation, animal parasites, including ticks and piroplasms. Reference has already been made above to temperature conditions. As regards humidity, the State presents two distinct periods, a wet season from November to March, and a dry season from April to October. It is during the wet season that the animals should naturally be in their best condition; but unfortunately, it is during this time that parasitic insects are most numerous.

In dealing with the biological factors (after describing the indigenous fodder grasses) an account is given of the diseases that have to be contended with. These include symptomatic charbon, mal de caderas, and Texas fever. It is stated in connexion with mal de caderas that this disease occurs generally in a sporadic fashion, suddenly appearing and as quickly disappearing. The chief factor in the acclimatization of animals is their successful immunization against piroplasms, and this subject is dealt with at considerable length. The Trypan blue treatment has proved successful.

The European breeds which seem to have the best chances of becoming immune to disease and adapted to the climatic conditions are as follows: horses—Arabs and Anglo Arabs from the south-west of France; cattle—Friesland, Dutch, the Schwyz breed from Switzerland, the Limosin, and the Jersey and Guernsey; donkeys—from the south of Italy; goats—the Toggenburg and Flemish breeds; pigs—Berkshire and large black; poultry—Bresse, black Opringtons, and Minorcas.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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NOTES AND COMMENTS.

Contents of Present Issue.

In this number the editorial deals with the law of diminishing return in its application to the extension of cultivated areas, the commercial investment of capital, and scientific investigation.

Under the caption Departmental Reports, on page 387, a review will be found of the work of the Agricultural Department, Grenada, for 1912-13.

A suggestive article dealing with the effect of different light intensities upon the growth of plants will be found on page 388.

On page 389 there appears a summary of sugarcane experiments in Barbados, 1911-13.

The British Cotton Growing Association's efforts to establish a cotton-growing industry in Australia are dealt with on page 390.

A very interesting notice of agricultural and industrial conditions in the Dutch West Indies appears on the opposite page.

Insect Notes, on page 394, comprise a continuation of the article which appeared in the last issue of this journal on insect pests at St. Croix.

Mycological investigations in Florida are dealt with under Fungus Notes, on page 398.

Lime Cultivation in the West Indies.

It is gratifying to be able to state without qualification that Pamphlet No. 72 has received a very wide and favourable reception. By referring to the cover of this issue of the *Agricultural News* the reader will find full evidence in support of this statement in the form of extracts from notices that have recently appeared in leading technical journals, and in West Indian newspapers published in those Colonies where a lime industry is already established or where doing so is in contemplation.

There are two industries which have one great point in common, and they are the lime growing and the sugar industries. Each has its rival. The lime must compete with the lemon, and the sugar-cane has to contend with the beet. Cacao, coffee, rubber, rice and tea are to a large extent, free in this respect. Hence in the production of lime and sugar-cane products, economy is of first importance; and just as in the case of sugar-cane cultivation and manufacture, improved methods are continually being introduced, so must this take place also in connexion with lime growing and the manufacture of lime products. At present high prices prevail. Should there, with increased supply, occur a tendency for prices to fall, the importance of economy in production will be manifest at once. The necessity for new markets and new uses will become urgent also.

Pamphlet No. 72 shows that the production of lime products is an industry, and an industry involving a knowledge of techique based on biology, chemistry, engineering and economics, having, as already intimated, its parallel in the sugar industry. But the pamphlet by no means says the last word on the subject.

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India and Agricultural Research.

The issue of the *Agricultural Journal of India* for October 1913 contains a reply to a review of Mr. W. Lawrence Ball's book The Cotton Plant in Egypt—Studies in Physiology and Genetics. This review was dealt with editorially in the *Agricultural News* some months ago, just after its appearance, and readers who are interested in the discussion should refer to this leading article.

The reply under consideration deals with the opinions expressed in the review with regard to their bearing upon official agricultural policy in India. The writer of the reply quotes the following passage from the review: ' "the large amount of work here recorded [referring to Balls' book] does not appear to be of any immediate economic importance. Moreover it may be suggested that even from the scientific point of view the expenditure of time even by an official of an Agricultural Department on such work is a mistake". This can only mean [continues the writer of the reply] that in the publication work of our own [the Indian] Department for instance, no work which is not of direct economic importance should appear, and no officer of the Department should take up any piece of work unless he can, practically speaking, guarantee that it will lead to some commercially profitable result'.

We scarcely think this inference is altogether justified, for it was only this particular set of Egyptian studies that was referred to and the reviewer clearly stated his appreciation of the value of abstract research in general, provided it led to the discovery of principles, facts and relations of wide application and significance.

To continue the main point at issue, the writer of the reply emphasizes the importance of pure biological research to India, for although it would be unthinkable, almost impossible, to cut adrift from Europe and America, most of the important contributions of science in these continents are not negotiable in the peculiar physical, social and financial conditions of India. India has to work out its own economic salvation. Pure research is a *necessary condition* there for economic advancement.

Agricultural Progress in Curacao and Its Dependencies.

Although geographically in close proximity to the British Islands, not a great deal is heard locally concerning developments in the Dutch West Indian Islands. For such information the reader is referred to Diplomatic and Consular Reports, No. 5195—Annual Series, on the trade and commerce of Curaçao and its dependencies for the year 1912. Agriculturally Curaçao is interesting in view of its possessing large phosphate deposits. These mines have lain idle for about twenty-eight years, but since they have now been sold by auction they will be steadily worked and offer continuous employment to a number of native labourers.

One of the latest institutions in Curaçao is the new ostrich farm which was established in August 1912 with a paid up capital of £6,250. At the time, twenty fine birds were imported from Egypt and three have since died; but fourteen chickens have been hatched. As the climate is excellent, the general belief is that it is well adapted to the raising of these birds, and the feeding, which in very dry months may be a difficult problem has so far given no trouble.

In St. Martin and St. Eustatius one of the chief agricultural industries is cotton growing, but on account of the severe drought in 1911 the yields from the crop were low but of excellent quality. In St. Eustatius much confidence is placed in cotton cultivation, and already several large stock-rearing estates have been converted into prosperous cotton fields.

In connexion with the industries not strictly speaking agricultural, reference may be made to the hat-making and hempen sandal industries, and to the production of orange peel from which the extract of the renowned Curaçao liqueur is distilled.

The severe drought of 1911-12 was the cause of very great distress in the Dutch West Indies. Appeals from Curaçao to the Netherlands met with a most generous response, about £3,000 having been received from Her Majesty Queen Wilhelmina, and from several other sources. As the whole amount was not immediately required a distress fund was started, though in view of the fact that normal prosperity has been quickly regained, there is little likelihood that for the present this will have to be drawn upon.

Where Ceylon Has the Advantage of Brazil.

It may appear somewhat startling to compare Ceylon with Brazil, yet the two places have something in common—rubber is an important product of each. As intimated in the *India Rubber World* (November 1, 1913), the differentiating feature is that the great staple of Brazil is coffee, whereas that of Ceylon is tea. Both countries have been confronted with the same danger—the over-production of their staples. Ceylon's situation in this respect is much more favourable than that of Brazil, for in Ceylon as fast as tea threatens to outstrip the demand it can be changed forthwith to the production of rubber. But the situation in Brazil is different. Over-production of coffee in Brazil is an actuality; yet if Brazilians could transform some of their coffee estates into rubber plantations the problem would be solved, but unfortunately they cannot, for their rubber comes from the north and their coffee from the south. Hence in this respect Ceylon has the advantage of Brazil.

Tapping Castilloa: Investigation Required.

Economically the rubber industry in general is in a very unsettled condition, but with regard to Castilloa, a special difficulty of production has arisen in connexion with the tapping of this tree. It was thought possible that the machine described in the *Agricultural News* under the name of 'Valour' might prove useful for purposes of extraction, but recent communications have made it evident that this machine is of no use for the purpose, at any rate from a commercial point of view.

The Hon. W. L. Thornton, of Tobago, for instance, writes to say that although a Castilloa tree when coppiced regularly sends up fresh shoots which grow very rapidly, it has not been found possible to extract good rubber from these cuttings. Bark from fourteen-year-old trees has been passed through the rollers of a sugar mill and although a milky liquid, looking much like latex can be squeezed out, only traces of rubber are recovered by any process that has so far been tried. The latex is no doubt mixed with other juices from the tissues, and these may possibly interfere with coagulation.

From all accounts of the condition of Castilloa cultivation in Trinidad, Tobago and other islands, there is urgent necessity for attention being directed towards effecting some improvement in the methods of removing the rubber from the tree. In considering the matter, it must be borne in mind that in the mechanical extraction of rubber from Landolphia and Manihot, it is actual rubber which is removed, whereas in the case of Castilloa, it is only the latex that is separated. This seems to present physiological difficulties, for the amount of latex yielded by tapping is, of course, not directly proportional to the amount of bark removed, whereas in the case of a mechanical extraction it would be.

INSECT NOTES.

INSECT PESTS AT ST. CROIX.

In the last issue of the *Agricultural News* an account of the chief insect pests of sugar-cane, dealt with in the Annual Report of the Agricultural Department, St. Croix, was published. The remaining pests of the sugar-cane and those of cotton will now be described.

The moth borer of sugar-cane in St. Croix is a serious pest For its control it is recommended to collect and burn all infested and rotten canes immediately after the crop is reaped, and to plant no cuttings in which any borer holes are to be seen. The weevil borer (*Sphenophorus sericeus*) occurs in cane fields in St. Croix each season. It can be controlled by the prompt collecting and burning of all rotten canes after the crop is reaped. Root borer grubs, similar to those of *Diaprepes abbreviatus* in Barbados, have been found at the base of cane plants in St. Croix, but these do not appear to cause any considerable amount of damage.

A large longicorn beetle, *Lagochirus araneiformis*, has in one instance, been discovered as a borer of canes at the Experiment Station. Several grubs, a pupa and two adult beetles were taken from canes which were being reaped. As this insect is generally distributed throughout the West Indies and in Central Africa and has not before appeared as a pest of sugar-cane, it is likely that the attack on sugar-cane here reported is an accidental occurrence, and that but little is to be feared from future attacks.

COTTON.

The pests of cotton in St. Croix are mostly the same as those occurring in the adjoining islands of the Leeward group.

The cotton worm (*Alabama argillacea*) appeared at several times during the season and was controlled by the use of Paris green and lime. There were complaints of injury to the leaves by the Paris green, and planters were recommended to use for the purpose dry arsenate of lead mixed with lime. It was found that this poison, though slower in its action on the cotton worm, did not injure the leaves, and it remained on the plants longer than the Paris green. The cotton worm is also controlled to some extent by natural enemies.

The cotton boll worm (*Heliothis obsoleta*) is probably the most serious pest of cotton in St. Croix. Four other caterpillars also attack the flower buds and bolls of cotton plants in St. Croix. These are *Prodenia ornathogelli* and *P. latifascia*, and two which have not yet been identified. The attacks of these insects caused a very considerable amount of loss to cotton planters during the season. An extended trial was made of the use of trays containing molasses for catching the moths: a large degree of success is reported.

These trays were small in size, about 1 square foot in area; they were partly filled with molasses and placed on the ground in the cotton field, about ten trays being used to each acre. The catch of moths each night amounted to some 400 to 500 per tray, with the result that the abundance of the boll worm was greatly reduced. The report does not state, however, how many different species of moths and other insects were caught in this manner. Arsenate of lead applied in a dry condition as for cotton worm is considered likely to be useful, as a check on the boll worm when it passes from one boll or bud to another.

Boll worms are parasitized by a Sarcophagid fly to some extent: this is probably of value in the natural control of this insect. The fiery ground beetle (*Calosoma calidum*) is another natural enemy of value in this connexion.

The green stink bug or leaf bug (*Nezara viridula*) caused a considerable amount of damage in one locality, by sucking the juice from the plant causing the bolls to drop.

This insect was found to lay its eggs on wild Massambé (*Cleome viscosa*), and on the fireweed (*Datura metal*) and planters were advised to destroy these plants wherever they were seen. The wild Massambé generally comes in and covers any field if allowed to lie fallow after cotton. A quick-growing cover crop should be planted to prevent this. Sweet potatoes, Lyon bean, pigeon peas, or Guinea corn are recommended for this purpose.

The leaf-footed plant bug (*Phytoglossus gonandra*) appeared on certain fields for a short time only, and caused some loss from boll dropping and injury to bolls by the punctures made in feeding.

The cotton stainer in St. Croix is the white-marked stainer (*Dysdercus andreae*) which occurs in the Leeward Islands.

Cotton stainers were prevalent in St. Croix in large numbers during the year under review than in the previous season. At the Experiment Station they were so abundant that spraying with kerosene emulsion was resorted to. The usual practice is to knock them off the plants into tins containing kerosene and water.

Leaf-blister mite (*Eriophyes gossypii*) has been a pest of such a serious nature that an Ordinance was passed (1908) to provide for the uprooting and burning of all old cotton after the first and second pickings had been secured. As the law now stands, it provides for a close season, that is, a season during which no cotton shall be grown on any given estate, or in any given district. The time for the close season is not the same for all estates and all districts, but is fixed yearly by a commission. It would appear from the report that the law works well and that a close season is essential in order to keep the leaf-blister mite within reasonable bounds. It is stated that the mites are carried about from plant to plant by the moths of the cotton worm.

Cut worms were controlled by the use of a teaspoonful of poisoned bait placed near each spot where the seed is planted. The bait is made by mixing together into a stiff paste 50 lb. bran (pollard), and 1 lb. Paris green with molasses and water.

Mealy-bugs (Dactylopius) and the cotton aphis were observed on cotton, the latter abundantly during the dry weather. These are preyed upon by the lady-birds and syrphus fly larvae, which probably exercise a fair degree of control over them. A species of a Diaprepes weevil is frequently found feeding on the tips of the branches of the cotton plant. They are nearly always to be found in pairs and may easily be dislodged by shaking the plant, when they may be killed.

During the year it was observed that a Thysanopterous insect (thrips) attacked very young flower buds and caused them to drop.

PESTS OF SWEET POTATOES AND OF INDIAN CORN.

The scarabee or Jacobs (*Cryptorhynchus batatae*) attacks potatoes in all parts of the island. On this account, it is recommended that this crop should not be planted on the same land at shorter intervals than two or three years.

Indian corn was seriously attacked by the corn ear worm and the corn fly or leafhopper (*Dicranotropis*[Delphax] *maidis*). The Barbados varieties suffered less from the attacks of both these pests than any of the others under trial.

RUBBER INDUSTRY.

SELLING METHODS FOR PLANTATION PARA.

An important meeting of Chairmen and Directors of rubber plantation companies has just been held in London, to consider certain proposals for improving the present methods for marketing plantation rubber. (The economic side of the plantation Para rubber industry has been dealt with in the *Agricultural News*, Vol. XII, pp. 271, 277, 323, 342, 377.)

A lengthy report on the meeting appears in the *India Rubber Journal* (October 25, 1913). It is learnt from this that the combination principle has been agreed to, and it has been left to the Rubber Growers' Association to propound a scheme.

The Chairman (Mr. A. A. Beauman, Chairman of the Rubber Share Trust and Finance Co., Ltd.) stated in the course of his speech that he would vote for Mr. Emerson's resolution embodying his central selling agency scheme. For the growers, Mr. Herbert Wright proposed an amendment of Mr. Owen's resolution.

The object of Mr. Herbert Wright's amendment was to introduce a definite step, such as could not be attained by adopting Mr. Owen's resolution. Mr. Wright requested the meeting to vote purely and simply on the desirability of effecting combination among sellers. This amendment was seconded by Mr. W. F. de B. McClaren.

At the conclusion of the meeeting the amendment was put to the vote and declared carried, only fourteen hands being raised against it. Many of those present did not vote. The Chairman voted against the amendment.

It may be added that the meeting at which the above proceedings took place was highly representative and influential, and one of the largest that has ever taken place in connexion with the rubber industry.

In regard to the production and consumption of rubber, the following estimates, may interest readers of the *Agricultural News* :—

World's production in tons.

I.—ACTUAL.

	Plantation.	Brazil.	Rest.	Total.	Consumption.
1905	145	34,000	26,800	61,000	61,000
1906	510	36,000	29,500	66,000	66,000
1907	1,000	38,000	30,000	69,000	69,000
1908	1,800	39,000	24,200	65,000	65,000
1909	3,600	42,000	23,400	69,000	68,500
1910	8,200	40,500	21,300	70,000	66,000
1911	14,100	39,500	22,400	76,000	73,000
1912	28,500	40,500	30,000	99,000	98,000
1913	42,000	41,000	32,000	115,000	112,000
		II.—ESTIMATED.			
1914	64,000	40,000	20,000	124,000	126,000
1915	94,000	38,000	10,000	142,000	142,000
1916	121,000	35,000	5,000	161,000	159,000
1917	147,000	32,000	2,500	181,500	179,000
1918	166,000	30,000	nil	196,000	197,000
1919	183,000	30,000	nil	213,000	216,700
1920	198,000	30,000	nil	228,000	238,370
1921	209,000	30,000	nil	239,000	262,200

The disappearance of the African supplies (=Rest) should be noted.

INFLUENCE OF POSITION AND SLOPE OF INCISION ON YIELD OF LATEX.

Javanese experiments are described in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (September 1913), by means of which an attempt was made to determine the influence of the position and slope of the incision on the yield of latex. Incisions of equal length made at equal heights and in the same direction 2 inches apart gave the same results. Such incisions any given number of inches apart, and distributed all round the trunk, also gave the same results.

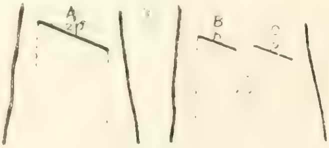

Fig 29.

In connexion with Fig. 29, A is equal in length to BC; if the yield for A is taken as 100, two series of experiments gave 119·7 and 123·9 for B+C. In other words, the double incision gave about 20 per cent. more latex than the single incision.

Referring to Fig. 30, it was found that the left-hand tapping C, gave latex equal to 100 when the right-hand tapping D gave 85·7, or approximately 14 per cent. less.

In interpreting the results, reference is made to Petch's discovery in Ceylon that left-hand tapping usually yields more latex than right-hand tapping. This was explained on the ground that the fibres of Hevea are not absolutely vertical. In the experiments under consideration the investigator attempted to confirm Petch's hypothesis, which was based on observations obtained with only a small number of individuals. This was accomplished by successfully establishing experimentally the truth of the following equation :—

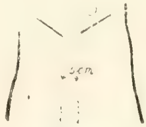

Fig 30

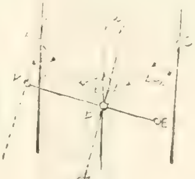

Fig 31.

$$\frac{\text{Yield of AB}}{\text{Sin }(a+b)} = \frac{\text{Yield of BC}}{\text{Sin }(b-a)}$$

AB represents the length of the left-hand cut and BC that of the right-hand cut; a+b (corresponding angle to b−a) represents the angle formed on the bark by BA and KA, KA being the line parallel to the latex tubes and running through the top end of the cut. Similarly b−a is the angle formed by BC the right-hand cut and the line passing through the upper end parallel to the latex vessels. (See Fig. 31.)

The following conclusions are drawn : (1) Petch's hypothesis is a rational one ; (2) as a method of tapping the half herring bone to the left is preferred to the herring bone or half herring bone to the right ; (3) the ideal angle, would be at right angles to the latex tubes, but as the incision would then be almost horizontal, some arrangement like a gutter, would be necessary to guide the flow.

GLEANINGS.

The exportation of grape fruit to England from Cuba is advocated in the *Cuba Review* (October 1913).

The importance of not planting red-coloured sugar-cane in places where syrup is manufactured is emphasized in an article in the *Louisiana Planter* (November 1, 1913).

The area under coco-nuts in the Federated Malay States in 1912 was 157,600 acres, an increase of 14,826 acres over that of 1911. (*The Board of Trade Journal*, October 9, 1913.)

A note occurs in the *Hawaiian Forester and Agriculturist* (September 1913) to the effect that the Chinese Republic has established a Department of Agriculture and Forestry.

The development of Berbice depends largely, according to the *Demerara Daily Chronicle* (Mail Edition) November 7, 1913, upon the provision of a produce agency, and upon general co-operative organization amongst the small farmers.

It is stated in *The Board of Trade Journal* (October 30, 1913) that the Argentine Government is encouraging the cultivation of cotton by means of the distribution of seed, the construction of roads, and the provision of land-purchasing facilities.

Soldiers on field service in the British army will in future receive 3 oz. of sugar with their daily ration, an increase of 1 oz., the War Office recognizing it as a valuable sustaining food. (The *International Sugar Journal*, October 1913.)

According to *Tropical Life* (October 1913) the crop year exports of cacao from Trinidad and Grenada for the twelve months October 1, to September 27, 1912-13, is: Trinidad, 235,275, Grenada, 63,036. For 1911-12 the figures, were 221,606 and 69,781 respectively.

The Voice of St. Lucia (October 18, 1913) reproduces the paper read before the Antigua Agricultural and Commercial Society by His Excellency the Governor of the Leeward Islands, on the extension of corn cultivation Interest in this subject appears to be rapidly extending.

Agricultural progress in Ashanti, according to *Colonial Reports*, Annual, No. 771, lies in the direction of cacao planting. Although the exports for 1912 showed only 26 per cent. increase on the previous year, it has to be borne in mind that the majority of the trees are as yet too young to bear fruit.

Sanction has recently been given for the projected railway extension in Nigeria. It will be 550 miles in length and of the standard African gauge. It is estimated that the cost will be £3,000,000; and that it will take from four to five years to complete. (*Journal of the Royal Society of Arts* October 31, 1913.)

The issue of *Science Progress* for the quarter ending July 1913, contains an article entitled Recent Work on Volcanoes. A description is given of the Mt. Pelée eruption, and it is pointed out that Pliny, Epistola XX, describes a similar blast to that which characterized the West Indian outburst, in the eruption of Vesuvius in 79 A.D.

On the basis of a normal yield of 9 cwt. per acre, the total outturn of winter rice in Assam comes to 20,097,700 cwt. this year, against 32,563,400 cwt. last year. A Circular of the Department of Land Records and Agriculture, Assam, states that as there are two more forecasts to be issued for the 1913-14 crop, these figures of outturn may be altered later.

A copy of the report of the Land and Mines Department, British Guiana, from April 1, 1912 to August 31, 1913, has just been received. The condition of the various rubber plantations appears to be very satisfactory and the rice industry is rapidly gaining ground. Five permissions have been granted for cattle ranching tracks on the hinterland savannahs.

As the outcome of an article in the *Agricultural News*, it was decided last year to endeavour to obtain some cuttings of 'M'Gereb', a new stock for oranges, through the medium of Kew. These were obtained from Algiers and forwarded *via* Kew to Dominica where they have arrived safely in Wardian cases, and have been planted in beds and are being carefully tended.

An article on the West Indies and Federation appears in *The Times* (October 8, 1913). Reference in this article is made to the Imperial Department of Agriculture, and although the views expressed seem to be rather exaggerated in regard to the success of this Department, it is made evident that the Department has served useful purposes in connexion with co operation, and as a distributing centre of agricultural information.

According to the *Leeward Islands Gazette* (October 16, 1913) a considerable increase has occurred in many of the staple articles of export in Antigua during the period January 1 to August 31, 1913, compared with the same period for 1912. It is interesting to note the number of crates of onions shipped during the 1913 period was 4,406 compared with 2,742 for the 1912 period. Seven hundred and fifty-one bales of cotton were sent out compared with 420 for the first six months of 1912.

A communication has lately been received from the Secretary of State for the Colonies in regard to the cultivation of soy beans in Ceylon. There is at present no likelihood of an export trade in these oil seeds from that Colony. Attempts to grow soy beans were made by the Ceylon Agricultural Society between 1905 and 1910. The white seeded variety from Japan did not thrive, but the black Java variety was found to grow freely. The cultivation has not, however, been taken up to any large extent.

STUDENTS' CORNER.

INFORMATION CONCERNING LAND MEASUREMENT.

II.

In the previous article information was given in regard to the measurement of survey lines. In the present article, information will be given in connexion with the laying out of survey lines.

PRELIMINARY INSPECTION.

In all chain surveying work the area to be measured is included within an imaginary triangle or a series of imaginary triangles, and the lines forming their sides are measured with the chain in the manner already described. In order to ascertain the best position, and to obtain a clear course as free from obstacles as possible, it is first necessary to walk over and examine the ground. A rough sketch map of the area should be made and the lines it is intended to lay down should be roughly indicated on this preliminary plan. Having done this, the points or stations should be selected in the field, and the poles ranged out and inserted perfectly straight.

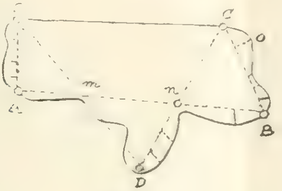

FIG. 32.

These poles must be set up exactly perpendicular; and where the lines are of considerable length their fixation may be facilitated by using a field glass, care being taken that the axis of the instrument is in true alignment.

THE BASE LINE.

In deciding upon the arrangement of the lines, an attempt should be made as far as possible to include the whole area within one large triangle or a system of large triangles. The base of the triangle, or of the main system of triangles should be extended throughout the whole length of the survey wherever circumstances will allow. This line (or base) is called the 'base line'. It is the first line that is laid out and generally the first line to be measured.

THE QUESTION OF OFF-SETS.

Considerable difficulty is often experienced in regard to the measurement of the boundary, particularly if it is very irregular. Fig. 32 shows that part of the boundary may lie within and part without the external survey line. The measurement of the areas cut off in this way is done by means of taking off-sets, that is to say, by measuring at regular intervals from the outside chain line perpendicularly to an opposite point on the boundary line. Generally speaking a limit of 20 to 30 links should not be exceeded in taking off-sets. To avoid the use of long off-sets, great care should be taken to get the outside survey lines of the big triangle to pass as near the objects or boundaries of the area to be surveyed as practicable.

TIE LINES.

The skeletons of the survey having been measured, it is next necessary to prove their accuracy by means of further measured lines, termed check, or 'tie lines', and this is best obtained by lines measured from the apex to the base of each triangle. Where lines from the apex are not available, owing to the nature of the ground, the triangle may be checked by lines measured across the adjacent sides of any two angles.

The student will more readily understand what has been stated above by referring to Fig. 32 which represents a seven-sided field such as might be found on any estate or plantation. It may be regarded as being, say, from 15 to 20 acres in area. One of the sides CE is straight and the fence A *m* D *n* B is too much bent to be taken by one line crossing and recrossing it with off-sets taken to the right and left. EC is the base line and EDC is the main triangle. In the present case *m n* is the tie line. *O* is one of the off-sets.

EC, AB, BC, CD, DE, and EA will be measured consecutively.

The manner of plotting these lines will be dealt with in another issue.

Dominica Planters' Association.—A general meeting was held in the St. George's Hall on October 27. The members present were Mr. E. A. Agar, Chairman, Messrs George Carew, Gerald Carew, H. A. Frampton, E. Frampton, A. K. Agar, L. L. Bell, J. F. Marsden, A. St. Hilaire, A. Davenport, and G. G. Downing, Honorary Secretary.

The principal business of the meeting was the revision of the rules, which were considerably altered and improved.

There was a discussion as to the desirability of inducing the surplus labour from Panama to come to Dominica, but the meeting did not think that they would be of much use now as ordinary agricultural labourers.

It was also resolved to ask His Honor the Administrator to take steps to check the ever-increasing crime of praedial larceny, as the Produce Protection Ordinance has not done what was hoped from it to protect the thefts of those products detailed in that Act, while no attempt has ever been made for the adequate protection of the growers of ground provisions.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados by the R.M.S. 'Magdelena' on Monday, December 1, 1913, for an official visit to Antigua. Dr. Watts is expected to leave Antigua by the R.M.S. 'Cobequid' on December 14 for St. Vincent, from which island on the 22nd instant, he embarks on the Intercolonial Royal Mail Steamer and is expected to arrive in Barbados on December 24.

The Board of Trade Journal (October 23, 1913) publishes an article on the oil palm industry in Southern Nigeria in which it is stated that the present insufficient available labour is adversely affecting the palm oil and kernel industry. Southern Nigeria being a new and progressive country the calls on labour are so many and varied that the latter is diverted to the work which attract the labourers most. (See page 398 of this issue.)

FUNGUS NOTES.

MYCOLOGICAL INVESTIGATIONS IN FLORIDA.

The Annual Report for the year 1912, of the University of Florida Agricultural Experiment Station is to hand, and contains as usual matter of interest to tropical agriculturists, especially with regard to the artificial control of insects by fungoid parasites, and the pathology of Citrus trees.

ENTOMOGENOUS FUNGI.

One looks forward to this report for information as to the progress of the campaign against the Citrus white fly (*Aleurodes citri*) carried on by spraying with the spores of *Aschersonia aleyrodis*, *Aegerita webberi*, *Microcera* sp. and *Verticillium heterocladum.* This and the similar campaign against the froghopper in Trinidad by means of *Metarrhizium anisopliae* are being watched with very great interest by plant pathologists, as serious attempts to demonstrate the possibility of the artificial spread of insect-destroying fungi to a practical extent. Previous attempts, where they have not completely failed, have at least been indecisive, and the writer knows of no case where a method of this nature has passed into accepted practice. Usually the attempts have been discontinued when the first enthusiasm of the persons conducting the experiments has been dissipated. With the larger supply of material rendered readily available by improved mycological technique, there is however room for hope of a practical outcome, though the intimate dependence of the fungi for successful development on weather conditions will probably limit the use of such methods of control to specially situated localities or specially favourable seasons.

In Florida, according to the report before us, the highly favourable results hitherto announced are being well maintained. For example, in a specified Citrus grove sprayed with fungi in 1909, at which time the white fly was said to have been very prevalent, so complete was the parasitism still prevailing that it required a five minute search to find a single live larva, although no further application since the original one had been made. The spraying of the spores has become an established commercial pursuit, and one of the operators thus employed reported in September 1911, that with two, three, or four helpers he had sprayed altogether 94,129 trees, belonging to 108 different owners, since March 1911, while two other men associated with him sprayed from 25-30,000. Besides this spraying he had shipped 218,800 leaves bearing the different fungi to 105 growers. Another man following the same business in 1911 sprayed 39,444 trees; 3,330 of these he resprayed, and 935 were sprayed a third time.

Only passing allusion is made in the report to the control of scale insects by fungi, but there is an observation that certain trees sprayed with Bordeaux mixture showed such an immense increase in scale insects, due to the destruction of the parasitic fungi, that they were nearly killed.

PATHOLOGY OF CITRUS FRUITS.

The most interesting information in this connexion concerns the long standing and much discussed problem of the origin of melanose, which information is contained partly in the sectional report of the Plant Pathologist and continued in the subsequent Bulletin 111 by B. F. Floyd and H. E. Stevens.

Melanose was first discovered in Florida in 1892, and has since been reported from Australia, Algeria, Jamaica, and Porto Rico. It has been observed on nearly all varieties of Citrus plants, none having been found to be particularly immune. It affects leaves, stems and fruits while they are young and succulent, producing markings which consist of raised areas of brown gum-filled cells, forming dots, lines, curves, rings and irregularly shaped spots. The markings are often arranged in vertical streaks (tear streaking) following the track of water dripping from an overhanging dead twig. To the touch, the roughness suggests the feel of sand-paper—a fact which is of some value in distinguishing this from other forms of injury of a similar nature. No fungus or bacterial organism was found in connexion with the spots which could be considered as producing the disease.

The organism ultimately established as the cause works in a highly novel way. The observation which gave the clue to the solution of the problem was that the markings were regularly associated with dead twigs overhanging the affected organs. It was found that water in which such dead twigs had been soaked would produce the characteristic markings on young growths upon which it was allowed to drip, provided that the latter were kept for a short time in a humid atmosphere. Such water when thoroughly filtered failed to produce this effect, thus excluding soluble toxins as the cause. The twigs were infested by various saprophytes, amongst which the fungus *Phomopsis citri*, Fawcett, regularly occurred. Finally, spores from pure cultures of this organism when suspended in water were found to be capable of causing the characteristic appearance of melanose. The fungus is but weakly parasitic and appears to undergo no further development after the marks have been produced.

The same fungus has been established as the cause of stem end rot of Citrus fruits, usually gaining access where scale insects have weakened the fruit by developing in great numbers about the calyx.

The incidence of these two diseases is thus shown to be dependent upon the presence of dead twigs or branches, and it is upon the removal of such that their control depends.

VEGETABLE OILS.

OIL PALM FOR THE WEST INDIES.

Some mention has been made lately with reference to the possibility of growing the oil palm of Southern Nigeria on plantation lines in British Guiana and in British Honduras. The same question has apparently been brought up in the Federated Malay States for in the *Agricultural Bulletin* (September 1913), F.M.S., the whole question of production is dealt with in some detail. The following extract dealing with the cultivation of the oil palm is taken from the paper referred to:—

The oil palm is propagated from seed, only seed from eight to ten-year-old trees and upwards should be used for planting purposes as those from young trees are extremely small and in all probability would not give as good results as seed from mature trees.

The nursery beds should be raised, made of fairly rich humus soil and near a water-course if possible to ensure the proper humidity of the soil. The seed should be planted about 18 inches apart each way at a depth of from 1 to 1½ inches. The seed is said to take from four to five weeks to germinate but I find in this country they may take as long as three months. The beds require to be artificially shaded and in dry weather regularly watered. When the seedlings are 1 foot high they may be transplanted into their permanent quarters which should be about 25 feet apart. Holing similar to that of planting rubber is greatly beneficial.

The tree would appear from its distribution in Malaya to thrive on most soils, but a rich humus fairly damp but well drained would in all probability give the best results. Judging from reports, the rainfall is an important factor, but Malaya is well adapted in that respect.

In West Africa it would appear that the palm is cultivated only to a small extent, and then, in a rather primitive manner, the natives depend entirely on wild forests for their supply of palm fruits. It is a question whether a well managed plantation in this country where good rail and transport facilities exist will be financially as successful as collecting fruits from the African forests

Palm oil cultivation would lend itself well to catch crop such as coffee, as the palms give little shade until they are from six to eight years old, and then probably not too dense to interfere with the growth of catch crops.

On the Gold Coast a young palm six years old is said to bear one to six small bunches of fruit, whilst one of ten to twenty years has only one to six large bunches with well developed fruit. In the Western Province of Southern Nigeria we are told that full-grown trees yield from about two to twelve bunches of nuts annually, each bunch weighing from 20 to 56 lb. according to size. An average size bunch contains at least 200 nuts, and the weight of the latter varies from 7 to 21 lb.

The annual yield in oil of a tree is stated to be at least 7½ lb. in weight.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

GINGER.

At auction on the 1st of the month ginger met with no demand, and the offerings were all bought in. On the 8th there was a very large quantity offered, namely, 929 bags of Cochin and Calicut, 285 bags of Bengal and 79 bags of Japanese. The bulk of these were bought in at the following rates—washed rough Cochin at 26*s.* to 28*s.*, and rough Calicut at 30*s.* Of the Bengal, 35 bags met with purchasers at 19*s.* per cwt., while the whole of the Japanese was bought in at 21*s.* per cwt. A fortnight later, namely on the 22nd, all the offerings were bought in, comprising 98 barrels of Jamaica at 42*s.* to 50*s.* per cwt., for small to middling, 349 bags of Cochin and Calicut at 26*s.* per cwt., for fair brown rough, 26*s.* to 27*s* for washed Cochin.

NUTMEGS, MACE, PIMENTO AND ARROWROOT.

At the first two auctions in the month the offerings of nutmegs and mace were all bought in, but on the 15th there was a very large consignment of 978 packages of West Indian offered and nearlly all were sold at the following rates: 62's to 72's, 6*d.* to 9*d.*; 73's to 83's, 4¾*d.* to 7*d.*; 95's to 105's, 4*d.* to 4¾*d.*, 117's to 128's, 4¼*d.* to 4¾*d.* and 130's to 140's, 4¾*d.* to 5*d.* A week later 22 packages only of West India was offered and partly sold, most of them being defective, the prices realized were 4¼*d.* for 107's to 150's. At the last auction on the 29th the offerings were again small, West Indian being represented by 39 packages, which sold at the following rates: 4½*d.* for 104's to 114's, and 117's to 124's at the same price Some eastern were also disposed of: 59's at 10*d.*, 86's 5¾*d*, and 100's 5*d.* per lb. In the early part of the month there was no demand for mace, the offerings at the first auction being all bought in, and again at the second auction on the 8th there was no demand, some 37 cases of pale Penang being offered and bought in at from 2*s.* 4*d.* to 2*s.* 6*d.* per lb. On the 15th West Indian mace was well represented by 203 packages, which were all sold, 1*s.* 7*d.* to 2*s.* 3*d.* being paid for red to good palish, and 1*s.* 3*d.* to 1*s.* 7*d* for broken, at the last auction on the 29th some sales were affected at 1*s.* 7*d.* to 1*s.* 10*d.*, and broken at 1*s.* 5*d.* to 1*s.* 6*d.* Some packages of eastern were disposed of at 1*s* 10*d.* to 2*s.* 5*d*, and broken at 1*s.* 5*d.* to 1*s.* 6*d.* per lb. Pimento has been in slow demand, on the 8th 143 bags were offered and bought in at 2¼*d.* On the 15th, 57 bags were sold at 2⅛*d.* per lb for fair. St. Vincent arrrowroot was reported at the end of the month, to be selling privately at 3*d.* to 3¼*d.* per lb. while good Natal is held at 7¼*d.*

SARSAPARILLA.

Grey Jamaica, at the beginning of the month, was scarce, and at the auction held on the 2nd of the month was represented by 4 bales only, which was of fair quality, but slightly mouldy, all was disposed of at 1*s.* 11*d.* per lb. There was a steady demand for native Jamaica, of which 15 bales were offered and 11 sold, 9½*d.* being paid for good red press-packed, and 7½*d.* for inferior yellow to pale red. Thirteen bales of Lima Jamaica were also brought forward, but found no buyers. At the second drug auction on the 15th of the month sarsaparilla was represented by full supplies of all kinds, as follows: grey Jamaica 30 bales, native Jamaica 20, and Lima Jamaica 27 bales; of the first 28 bales were disposed of at easier rates, namely 1*s.* 9*d.* to 1*s.* 10*d.* for fair, and 1*s.* 7*d.* to 1*s.* 8*d.* for part coarse. The whole 20 bales of native Jamaica found buyers at 9*d.* to 10*d.* per lb. for good red press packed, 8*d.* to 8½*d.* for inferior pale red and yellow, and the same price for dull tawny. The whole of the Lima Jamaica was held at 1*s.* 8*d.* per lb. At the last auction on the 30th the only offerings were 3 bales of native Jamaica, and 13 of Lima Jamaica. For the first it was reported that the 3 bales had found buyers outside the auction, at an advance of 1*d.* to 2*d.* per lb. on previous rates. The 13 bales of Lima Jamaica were held at 1*s.* 9*d.* per lb.

KOLA, CASSIA FISTULA, LIME OIL AND TAMARINDS.

Kola was in good supply at the beginning of the month. At the first auction 82 bags of Jamaica were offered, 49 of which sold at 4*d.* per lb. for fair darkish halves. A fortnight later the supply was still plentiful, 77 bags being offered, but only 1 sold, and that consisting of small to bold somewhat shrivelled nuts from Honolulu which realised 3¾*d.* per lb. The remainder West Indian halves and whole, were held at 4*d.* At the last auction on the 30th, 31 packages were offered, and 2 sold consisting only of mouldy nuts and pickings which went at 1½*d.* per lb. The rest, being fair Jamaica halves were held at 3¾*d.* At auction on the 16th 2 cases of sound fresh plump pods of Cassia Fistula sold at 15*s.* per cwt. while 5 baskets of fair Java were bought in at 17*s.* 6*d.* per cwt. Lime oil has been reported plentiful during the month so that there is but little demand at present for it. The current quotations are 2*s.* to 2*s.* 3*d.* per lb. and for hand pressed 15*s.* Of tamarinds, on the 1st of the month 9 barrels of fair juicy Nevis were offered and sold at 11*s.* 6*d.* per cwt. in bond, in the last week the quotations were, ordinary dark to fair Antigua 14*s.* to 15*s.* and Barbados from 17*s.* to 18*s.* per cwt. in bond.

MARKET REPORTS.

London.—The West India Committee Circular, November 18, 1913; Messrs. E. A. de Pass & Co., November 7, 1913.

Arrowroot—2¾*d.* to 4¾*d.*
Balata—Sheet, 2/10½; block, 2/2 per ℔.
Beeswax—£8 10*s.* to £8 12*s.* 6*d.*
Cacao—Trinidad, 68/- to 75/- per cwt.; Grenada, 63/- to 69/-; Jamaica, 62/- to 67/.
Coffee--Jamaica, 55/- to 76/-.
Copra—West Indian, £32 to £32 5*s.* per ton.
Cotton—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 17*d.* to 19*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet, 35*s.* to 61*s.*
Isinglass—No quotations.
Honey—25*s.* to 35*s.*
Lime Juice—Raw, not in request; concentrated, £31 10*s.* to £33 5*s.*; otto of limes (hand-pressed), 11/6.
Logwood—No quotations.
Mace—1/8 to 2/6.
Nutmegs—4½*d.* to 7*d.*
Pimento—2 1/16*d.* to 2⅛*d.*
Rubber—Para, fine hard, 3/3½; fine soft, 2/10; Castilloa, 1/10 per ℔.
Rum—Jamaica, 2/5 to 5/- per gallon.

New York.—Messrs Gillespie Bros. & Co., November 14, 1913.

Cacao—Caracas, 14½c. to 14¾c.; Grenada, 14c. to 14¼c; Trinidad, 14c. to 14¼c.; Jamaica, 13c. to 13¾c.
Coco-nuts—Trinidad and Jamaica, selects, $39·00 to $40·00; culls, $23·00 to $24·00 per M.
Coffee—Jamaica, 10½c. to 15c. per ℔.
Ginger—8¾c. to 11¼c. per ℔.
Goat Skins—Jamaica, 50c.; Antigua and Barbados, 45c. to 48c.; St. Thomas and St. Kitts, 42c. to 44c. per ℔.
Grape Fruit—Jamaica, $2·50 to $3·25.
Limes—No quotations.
Mace—50c. to 56c. per ℔.
Nutmegs—110's, 13¼c.
Oranges—Jamaica, $1·00 to $1·50.
Pimento—4¼c. per ℔.
Sugar—Centrifugals, 96°, 3·54c. per ℔.; Muscovados, 89°, 3·04c.; Molasses, 89°, 2·76c. per ℔., all duty paid.

Trinidad,—Messrs. Gordon, Grant & Co., November 24, 1913.

Cacao—Venezuelan, $14·08 to $14·75; Trinidad, $14·10 to $14·35.
Coco-nut Oil—$1·08 per Imperial gallon.
Coffee—Venezuelan, 15c. per ℔.
Copra—$5·30 per 100 ℔.
Dhal—$5·00 to $5·25
Onions—$2·75 to $3·00 per 100 ℔.
Peas, Split—$6·00 to $6·25 per bag.
Potatoes—English, $1·30 to $1·65 per 100 ℔.
Rice—Yellow, $5·40 to $5·50; White, $4·80 to $4·85 per bag.
Sugar—American crushed, no quotations.

Barbados,—Messrs. James A. Lynch & Co., Ltd., November 29, 1913; Messrs. T. S. Garraway & Co., November 21, 1913.

Arrowroot—$5·25 to $6·50 per 100 ℔.
Cacao—$13·00 to $14·50 per 100 ℔.
Coco-nuts—$24·00.
Hay—$1·50 to $1·60 per 100 ℔.
Manures—Nitrate of soda, $70·00; Cacao manure, $50·00: Sulphate of ammonia, $82·00 to $85·00 per ton.
Molasses—No quotations.
Onions—$2·75 to $3·00 per 100 ℔.
Peas, Split—$5·80 to $6·00 per bag of 210 ℔.: Canada, $4·00 to $4·50 per bag of 120 ℔.
Potatoes—Nova Scotia, $2·50 to $4·00 per 160 ℔.
Rice—Ballam, $5·30 to $5·40 per 190 ℔.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $4·00 per 100 ℔.

British Guiana.—Messrs. Wieting & Richter, November 22, 1913; Messrs. Sandbach, Parker & Co., November 7, 1913.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	5c. per ℔.	——
Balata—Venezuela block	No quotation	——
Demerara sheet	65c. per ℔.	——
Cacao—Native	12c. per ℔.	13c. per ℔.
Cassava—	60c.	——
Cassava Starch—	$4·00 to $5·00	——
Coco-nuts—	$16 to $20 per M.	$16 per M.
Coffee—Creole	14c. per ℔.	15c. per ℔.
Jamaica and Rio	15½c. per ℔.	16½c. per ℔.
Liberian	12c. to 13c. per ℔.	14c. per ℔.
Dhal—	$3·60 to $4·25 per bag of 168 ℔.	$4·50 per bag of 168 ℔.
Green Dhal	$5·00	——
Eddoes—	$1·32	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	8c.	7c.
Peas—Split	$6·00 to $6·25 per bag (210 ℔.)	$7·00 per bag (210 ℔.)
Marseilles	——	——
Plantains—	10c. to 16c.	——
Potatoes—Nova Scotia	$2·75	$3·75
Lisbon	——	——
Potatoes-Sweet, B'bados	$1·44 to $1·68 per bag	——
Rice—Ballam	No quotation	——
Creole	$4·75 to $5·00	$4·50 to $4·80
Tannias—	$1·56	——
Yams—White	$3·00	——
Buck	$1·92	——
Sugar—Dark crystals	$2·15 to $2·20	$2·20
Yellow	$2·50 to $2·60	$2·65
White	$3·75 to $4·00	$4·00
Molasses	——	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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Agricultural Banks.

THERE will appear in the forthcoming issue of the *West Indian Bulletin*, a paper dealing with agricultural banks. It has been the aim of the writer of this paper to treat the matter in a rather different way to that which has characterized previous West Indian literature on the subject. First of all, the history of the movement in the West Indies and British Guiana will be traced during the course of the past ten or fifteen years—a sketch which will demonstrate, it is feared, that there has been an amount of discussion, during this period, out of all proportion to anything that has been actually achieved.

Members of societies, Boards and Commissions have spoken interestingly and sincerely of Raiffeisen's, Schulze's, Luzzati's and the other original systems of rural credit; they have appealed to their respective Governments for assistance which in many cases has been granted; they have actually caused to be founded with Government money, substantial loan banks of the limited liability type; and yet with the exception, perhaps, of Jamaica, Barbados, and St. Vincent, rural credit remains in much the same, if not in a worse condition than it was ten years ago.

What is it that is required? That is the first question that needs a definite answer. It would appear that a system of agricultural credit is required which will serve, broadly speaking, two classes of landowners: firstly, those who cannot offer real security, and secondly, those who can. The former class may be considered first. During the past ten years, there has been a land settlement movement in the West Indies, the object of which has been to remove the evil discovered by the Royal Commissioners in 1897. Apart from Government land settlement, there has also occurred, during recent years, a voluntary splitting up of the larger estates in many places, and there now exists a large class of peasant proprietors who from time to time urgently require small amounts of working capital, that is capital for reproductive purposes on their one-acre or five-acre holdings. Particularly in some of the larger land settlement districts, where members of the community are in close contact, a system of mutual credit is eminently desirable—as desirable as a system of mortgage credit is, for obvious reasons, undesirable. For these, societies of the Raiffeisen type, or the Raiffeisen type slightly modified, should prove useful and work satisfactorily.

The demands of the second class of landowners—the holders of larger properties—cannot, it is believed, be easily met in this way—at least not at first. For such landowners, a co-operative loan bank is wanted—an institution whose object is to facilitate land development, particularly, in Colonies like British Guiana, British Honduras, Dominica and St. Lucia. It is very necessary to regard the two demands for credit separately. And the reason why is obvious when we come to consider the methods of establishing the banks. In starting an unlimited society on the Raiffeisen system, the essential thing is to begin in a very small way, to restrict the area of operations and the number of the members of each bank. In a limited concern, the larger it is the better. With the Raiffeisen system, each bank is a unit, and the aim should be to increase the number of these units and eventually establish co-operation amongst them in order that a central bank may be formed, which will correspond very closely to the land credit bank for the larger proprietors. This latter point however, affects the future more than the present, and we may turn now more profitably to a consideration of the conditions of establishment.

In the forthcoming paper, already referred to at the commencement of this article, a forward step has been achieved through bearing in mind that methods which prove successful in Western Europe do not necessarily work under tropical conditions. That is to say, the application of principles must differ considerably. This being so, the writer has traced the agricultural credit movement in India, in the French and German tropical colonies and in the Tropics generally, in the belief that by investigating the methods adopted under somewhat analogous social and geographical conditions in other places, important lessons may be learnt which will help us to overcome the difficulties with which we are faced in the West Indies.

It is not necessary here to dwell upon the wonderful strides that have been made in regard to mutual credit in India, nor to treat at any length the subject of the successful establishment of land credit banks in German West Africa, Tunis, Queensland, Rhodesia and in other tropical or sub-tropical countries. But it is necessary to dwell upon this fact, that the success in India—in a country, be it remembered, offering far greater social difficulties, and a far wider range of general conditions than the West Indies—success in India has been due not to Government money, but to Government organization. That is the bond which holds the units together. In the West Indies there have been spasmodic monetary grants from the Governments for purposes of capitalization, and although in the initial stages of mutual credit banks, and indeed of the larger limited banks, Government capital is desirable, perhaps, absolutely necessary, it is not in this direction mainly that the money ought to be regularly expended. To be independent of Government capital should be the bank's principal aim, because the favourable terms of Government loans obscures the real commercial position of the society. But in the direction of providing a staff of Registrars and inspectors—a special credit Department—financial assistance may very well be given by the State. Benevolent control and energetic stimulation are, indeed, the first essentials. Added to this it is necessary to have uniform legislation. St. Vincent has been the first to take any definite step in the West Indies in regard to legislation to encourage the Raiffeisen credit system. The Ordinance which has recently been passed, provides for the registration and for the provision of capital to properly accredited societies; but it does not appear to make sufficient provision for Government supervision, and for that missionary work which will be necessary in the early stages. In India, a great deal of help has been afforded by 'honorary' promoters, and it may be expected that the same interest will be shown in St. Vincent. It is not likely, however, that the people themselves will move, or if they do, will achieve satisfactory results unless there is a benevolent but firm guiding hand.

Whether the example set by the Government of St. Vincent will be followed by other Governments remains to be seen. The step will no doubt be regarded as an interesting experiment and the results cautiously awaited before any extensive action is taken. From the idealistic standpoint, a general Act for the whole of the West Indies, to lay down the general principles on which credit systems are to be managed is desirable; though the actual application of them must be left entirely to the local authorities. Unfortunately, under existing conditions, this is impossible, and each island will follow its own policy. It is to be hoped and trusted however, that those Colonies which have agricultural credit at heart will regard the subject in the light of what it is—an economic, a scientific problem. The self-centred attitude is necessary for the arrangement of details, but with a problem like the present one a more continental frame of mind is required at any rate before the fundamental principles can be grasped, and before provision can be made to ensure continuous and co-ordinated development in the future.

VEGETABLE OILS.

'WOOD-OIL' TREES IN THE WEST INDIES.

The correspondence began in February 1911, when the Imperial Commissioner of Agriculture for the West Indies wrote to the Director of the Royal Gardens, Kew, for information concerning wood-oil and its botanical sources. After an examination of the references* obtained as a result of this correspondence, it was considered desirable to procure seeds of the more economically valuable species of the wood-oil trees (*Aleurites Fordii*) from Hong-Kong.

With this object, the Superintendent of the Botanical and Forestry Department, Hong-Kong, was communicated with from this Office and from Kew, with the result that early in January 1912, a small bag of *A. Fordii* seeds from trees grown in one of the Department nurseries was safely received in Barbados. A few weeks later two other and larger consignments arrived. These were from Foochow and were obtained by the Superintendent only after considerable delay and trouble occasioned by the disturbed state of affairs in China at that time.

The seeds were distributed to Antigua, St. Kitts, Montserrat, Dominica, and St. Lucia. They germinated successfully. According to the report on the Agricultural Department, Dominica, 1912-13, the seedlings are promising while in the nursery; but on being planted out in the field at low elevations, remarkably little growth is made. It must be remembered, however, that this tree in its native habitat thrives best on rather dry and rocky hillsides. A few plants are under trial in the Dominica hills, in which places it is expected better results will be obtained, though possibly the rainfall is too heavy. Evidently the tree has shown some promise in St. Kitts, for in the Report on the Botanic Station of that island for 1912-13, it is seen that forty plants have been raised in the nurseries and are being distributed in the Presidency. In all the islands, germination and early development have been satisfactory, but more time is required before final judgement can be passed as to subsequent growth and general suitability.

The genus to which this particular 'wood-oil' tree belongs is, as already intimated, Aleurites—a genus belonging to the Natural Order Euphorbiaceae. It contains six species, all trees and natives of extreme eastern Asia and Malaysia. The seeds of all the species are rich in useful fixed oils—hence the economic value of the genus. Although *A. Fordii* is a new introduction into the West Indies, *A. triloba*, one of the less useful species occurs on a fairly large scale in Nevis, and is also to be found regularly bearing fruit, in the Botanic Gardens at Antigua, Montserrat, Dominica and other places.

The chief species of commercial importance, however, other than *A. Fordii*, are *A. Montana*, Wilson, n. comb., which is restricted naturally to an area in south-eastern China (*A. Fordii* being confined to the central provinces of China from the coast to near the borders of Thibet), and *A. cordata*, R. Brown *apud* Stendel, a native of southern Japan. For an account of the distinguishing botanical characteristics of these species the reader is referred to the *Bulletin of the Imperial Institute*, Vol. XI, No. 3 (1913), p. 441 *et seq*.

From the economic aspect, the important point to bear in mind is that the oil from the seed of any of these species has been indiscriminately known to foreigners trading with China as 'wood oil'. According to the reference quoted above, tung-oil (oil from *A. Fordii*) possesses characteristic properties. Its specific gravity is higher than that of almost any other vegetable oil except castor and tallow-seed oils; it has a refractive index considerably higher than that of any known vegetable oil, and it has a high viscosity. The most characteristic property of the oil is its conversion into a firm, gelatinous mass when heated to a temperature of 250°C. or over, for a short time; this change appears to be due to polymerization and not to the absorption of oxygen. This polymerized oil does not melt on being further heated, and is insoluble in ether and the other usual solvents for oils. Genuine tung-oil should, on being heated, yield a firm jelly which will crumble readily in the fingers and is not sticky. Samples adulterated do not possess this property.

It would appear that these characteristics may be common to the oil of both *A. Fordii* and *A. montana*. At least nothing is stated in the reference to the contrary. But the oil from the Japanese species is entirely different. When heated at 250°C., this oil does not solidify. Also its specific gravity is lower than the Chinese oil.

The principal uses of tung-oil are in the paint and varnish industries, and there is a big and increasing demand for the product. It fetches a higher price than linseed oil. A significant feature of this demand in regard to the West Indies is that it exists principally in the United States and Canada. Already this Office has been in communication with a Canadian and an American firm in connexion with the matter, and indeed one of the first specimens of the seeds received at this Office was kindly sent from a firm in the United States.

As already stated, the tung-oil tree is essentially a hillside plant and prefers a dry rocky soil. If the trials which are now being conducted in Dominica and elsewhere show that the tree can thrive on West Indian hill-land, it might conceivably be possible to plant the tree in sufficient numbers for commercial purposes. The tree is a quick grower, bearing in four to five years. According to *Circular* No. 108, Bureau of Plant Industry, United States Department of Agriculture (1913), the imports of the oil into the United States in 1911 amounted to 5 million gallons, to produce which 40,000 acres of trees would be required, planted 20 feet by 20 feet—that is 108 trees to the acre *A. Fordii* has been successfully cultivated in the Southern States and it is believed that it would thrive in any warm-temperate, rocky locality. In the part of China where the tree luxuriates, the temperature seldom falls below 25°F., whilst the summer temperature is as high as 100°F. or more.

Since the above was written the November issue of *Tropical Life* has been received. This contains an article which is headed the Biao nut, Tung, or Wood-oil. It states that in the Philippines the tree which produces the Biao nut is known botanically as *Aleurites triloba*. The oil from this tree is sought after by the United States varnish makers, and it appears to be justifiable to assume that the Biao nut oil is in the same class commercially as tung oil, which as already stated in this article is derived principally from *Aleurites Fordii*. This information is naturally of considerable interest, in view of the fact that *Aleurites triloba* has been well established in several of the West Indian islands, especially in Nevis.

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*(1) 'Wood-Oil: Its source, character and uses'. Compiled by F. Boehm, 16, Jewry Street, London, 1902.

(2) *Kew Bulletin*, No. 4 of 1906.

(3) Exchange Catalogue of the Eala Botanic Garden (Belgian Congo) for 1909.

(4) *Bulletin of the Imperial Institute*, Vol. V (1907), p. 134. (See also *Ibid*, Vol. XI, No. 3, p. 441 *et seq.*)

SUGAR INDUSTRY.

A POSSIBLE EFFECT OF THE NEW AMERICAN TARIFF ON THE WORLD'S SUGAR INDUSTRIES.

The protection hitherto enjoyed by the American sugar refiner has been trifling, as far as the amount of preference is concerned. It was 12½ per 100 lb., till a year or two ago when it was reduced to 7½ cents. But the real protection was that no raw sugar was permitted to be imported above the Dutch colour standard of No. 16. Any raw sugar above that colour was charged the full duty on refined sugar. The result has been that all raw sugar for the American market, whether from Cuba, Porto Rico, Hawaii, and the Philippine Islands, or from non-preferential countries, such as Java, Brazil, St. Domingo, the West Indies, etc., has been specially produced below the colour standard, No. 16. Hence the American refiners have had a monopoly of the market for all moist refined sugars above No. 16, and a preference of 12½ (reduced recently to 7½) cents per 100 lb. on all white refined sugars. The new tariff has immediately abolished the limitation of colour, and will, on the 1st of March, abolish the protection on refined sugar.

The abolition of the sugar duty, in 1916, threatens Louisiana, Porto Rico, the Hawaiian Islands, and the American beetroot industry with serious injury or absolute destruction, unless they can find new ways of making sugar at less cost, and of higher quality. They were encouraged by every possible means to produce sugar, not only by ridiculously high protection but also by exhortation and instruction from the experts of the Government Department of Agriculture. This gives them a claim for consideration which would appear to be unanswerable, but which has been rejected with scorn. The abolition of the sugar duty has become a dogma and must be carried out regardless of consequences. A large revenue must be abandoned because it costs the sugar consumers the large sum of $1·00 per head annually. For the sake of that infatuated delusion the vast sugar factories in the United States and in the Tropics, which have been erected under the stimulus offered by the Government, are to be threatened with destruction. What are their owners to do to save themselves?

The answer is clear. . . . . . Factories and planters must find out how to keep going and make a profit, or they must collapse. Can they do it? We think they can, but it will take time, and money, and, above all, energy, capacity, good management, and determination. There is now no longer any incentive to them to turn out only raw sugar. The beetroot factories even now turn out all their sugar in the form of white granulated—the kind of refined sugar most popular in the United States. Mauritius, years ago, began to turn out white sugar direct from the cane juice. Java in recent years has done the same with conspicuous success. Mr. Prinsen Geerligs has told us exactly how it is done, and now we have a beautiful book* on the subject which gives us still further information. Here we have the parting of the ways and the opening of a new era in sugar production. The fatuous action of the American Government will give it a great impetus. The threatened sugar industries will jump at this new idea of producing white sugar direct from the cane juice. They see their opportunity. At very little extra cost of production they can turn our excellent dry white granulated sugar, pack it in handy retail quantities, and distribute it to the United States' consumers. Then the New York refiners will be sorry they spoke.

This production of refined sugar direct from the juice is no new thing as far as the industry of beetroot sugar is concerned. More than forty years ago we saw loaf sugar being turned out in a German factory. Then came Eugen Langen with his new process of making loaf sugar in the form of cubes. He turned them out not only in his refinery in Cologne, but also in his beetroot sugar factory at Elsdorf. Now we are told by the Java experts—the greatest and most reliability authority on cane sugar production—that what has been done with beetroot juice can be done also with cane juice. Large quantities of refined sugar—in fact a great portion of the Java crop—are now being shipped every year to the Indian market, and we are proud to add that our own colony of Mauritius takes a very good second place in this supply of excellent refined sugar to India

The threatened American sugar industries must inevitably adopt this remedy for their disease; and they must of course couple with it every possible scheme for reducing the cost of growing and producing their sugar. They will have a formidable competitor in the Cuban planter, who will probably follow suit now that he is no longer compelled to confine himself to raw sugar manufacture. The monster factories in Cuba, with all the latest improvements, are capable of turning out a very superior article. Dry, white granulated sugar will keep, and need not be thrown on to over-stocked markets. The present knocking down of prices during crop time can, therefore, be avoided.

All this is sufficiently alarming for the American refiners, but the new competition cannot be confined to the United States but must inevitably affect sugar refining interests in all quarters. British refiners have already had thirty years' bitter experience of foreign competition; but they have come out of it triumphant. They used to make all the refined sugars consumed in the United Kingdom, but now they have to be content to see 900,000 tons of foreign refined imported every year. They will probably hold their own in the future even if the new idea of making white sugar from the cane juice should be carried out on a large scale. Whether the same can be said of sugar refining in other parts of the world is doubtful. Twenty years hence our readers may accidentally turn to these prognostications and be interested to see how true—or false—they were. (*International Sugar Journal*, November 1913.)

It is stated in the *Louisiana Planter* (October 25, 1913), that agricultural developments in Porto Rico have been to a large extent due to the maintenance of research institutions for the exclusive study of the sugar industry out of private funds, or rather out of funds raised independently of the Government. It may interest West Indian readers to know that a great many varieties of seedlings from the West Indies, particularly from Barbados, have been rapidly extended. Among the most promising are D.117 and B.208, 147 and 1753. Yellow Caledonia from Hawaii has found favour in some sections.

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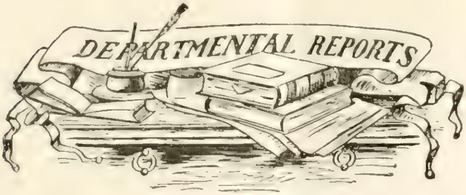
* Plantation White Sugar Manufacture, by W. H. K. Harloff and H. Schmidt, translated from the Dutch by J. P. Ogilvie, and reviewed in the *Agricultural News*, Vol. XII, p. 347.



ST. LUCIA: REPORT ON THE AGRICULTURAL DEPARTMENT, 1912-13.

This report, which has just been distributed, contains interesting information because of the important developments which are taking place in St. Lucia in connexion with agricultural matters.

EXPANSION OF THE LIME INDUSTRY.

Although the lime industry is expanding rapidly, it may be pointed out that sugar and its by products still hold the premier position in the value of the agricultural produce exported from the Colony. The total value of the sugar shipped in 1912 was £53,549, as against £56,504 for 1911. But whereas this shows a reduction, a marked increase has occurred in the quantity and value of lime products exported. Valued at £290 in 1911, it rose in [illegible] to £1,084. In the course of the next year or two a very rapid rise may be looked for. At the end of 1912 there were about 2,000 acres under limes, and during the year 45,600 lime plants were distributed from the Government Nurseries. A matter of vital importance in regard to lime cultivation in St. Lucia is the provision of adequate protection, by means of wind-breaks, from prevailing strong winds. These wind belts should be planted, not after, but before, the limes are established. The report provides information as to the best trees to use for the purpose. So far, *Eucalyptus paniculata* has shown great promise as a wind-break tree.

EXPERIMENTAL WORK WITH LIMES.

In connexion with lime cultivation, it may be pointed out here that some very interesting tillage and manurial experiments are now being conducted with the crop: the object of these experiments is to test the effect upon the trees of farming, shading, cutlassing, and hoeing. As regards the manurial experiments, the effect of stable manure and mulch is being tried.

CACAO.

Turning to cacao, it will be seen that the value of this product exported shows a decrease of £3,557, the total value for 1912 being £43,098. The market value of the produce, however, was in advance of that of previous years.

FUNGUS DISEASES.

During the period under review, a considerable amount of mycological work was done in St. Lucia. The infection experiments on the cacao root disease gave conclusive results, and showed the wide range of parasitism of the causative fungus, and the necessity for isolation trenches and good general sanitation in both cacao orchards, and on lime estates. Investigation is still required in regard to the banana diseases

PROGRESS IN MINOR INDUSTRIES.

The section of the report devoted to progress in the minor industries shows that it is possible that cotton cultivation may be revived in certain districts. The transfer of the experiment station from Union to Réunion ought to prove useful in regard to demonstration and selection work with this crop. Coco-nut planting continues to extend. It is interesting to note that bee keeping is quite an important minor industry in St. Lucia: the quantity of honey shipped in 1912 was 81,386 lb., valued at £704 8*s.*—a sum exceeding by £225 14*s.* any previous year's exports of this product. Orange cultivation has lately been regarded by planters with considerable interest, and the improved steamship communication between the West Indies and Canada, which is now commencing, should provide a stimulus for the extension of this cultivation. Finally, there is every likelihood of a successful trade becoming established between St. Lucia and Canada in papain.

AGRICULTURAL EDUCATION.

Turning to educational work, the report shows that the Department has directed its efforts along four lines: (a) prize-holdings competitions; (b) agricultural teaching in the elementary schools; (c) instruction to agricultural pupils at the experiment station; and (d) agricultural instruction to the pupils of St. Mary's College. Moderately encouraging results are recorded for the prize-holdings competition. This work received some set-back owing to the circulation of an unfounded rumour that the prize money was only in the nature of a loan and might be recalled by the Government. The examiner's report on agricultural teaching in the elementary schools shows there has been, during the year, a general all-round improvement. School gardens are, on the whole, a distinct success in St. Lucia. The examiner appropriately recommends a closer association of ordinary garden work with weighing, measurement and numeration. The remaining two lines of educational effort are, on the whole, answering useful purposes.

TWO IMPORTANT CHANGES.

Brief reference only is made in the report to the important changes likely to ensue from the establishment of a new experiment station and plant nurseries at Réunion in place of those at Union. It may here be stated that changes are now in progress and give every promise of successful development. In addition to the experiment station, the establishment of a scheme of peasant Land Settlement on the Réunion estate is a movement of some importance concerning which little can yet be said, beyond that a start has been made, and that the outlook is favourable.

NEW LIME JUICE FACTORY.

It may be appropriate, in concluding this review, to refer to the establishment of the new profit-sharing lime juice factory in St. Lucia. This will be managed by the Agricultural Department. The price offered for limes will be based upon the current prices of concentrated lime juice, plus a deferred payment in the form of a bonus to be given at the close of the season, provided the success of the season's work warrants doing so. This should insure its success financially, and its economic value from the point of view of the small estate owners.

CLIMATIC CONDITIONS.

The customary meteorological data are appended to the report. The average annual rainfall of twenty-five stations for 1912 was 72·92 inches. The highest rainfall was recorded at Warwick with 120·73 inches, and the lowest at Moule-a-Chique where 39·12 inches were recorded. November was the wettest month and February the driest. The mean monthly temperature in the shade was 79°F.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date December 1, with reference to the sales of West Indian Sea Island cotton:—

Since our last report about 100 bales of West Indian Sea Island cotton have been sold, which include Old Crop Montserrat at 15½*d.*, a few St. Kitts 17½*d.* to 20*d.*, and the remainder stains 10*d.* to 10½*d.*

The market is steady, but there is very little stock offering.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending November 29, is as follows:—

There was a good demand throughout the week with sales of 412 bales taking all of the offerings of odd bags of Extra Fine, of which there will be only a limited supply in the crop, and of Fully Fine off in preparation. There was also some demand for Fully Fine and better than, sufficient to keep the market steady at our quotations. For Fine, of which there are good offerings, there has been little or no demand but owing to being relatively reasonable in comparison with the Savannah market, Factors are hopeful of an early demand for them.

We quote, viz.,

Extra Fine	26c.	= 14¾*d.*	c.i.f., & 5 per cent.
Fully Fine	23c. to 23½c	= 13¼*d.* to 13½*d.*	,, ,, ,, ,,
Fine	22c.	= 12¾d.	,, ,, ,, ,,
Fully Fine off in preparation	20½c.	= 12*d.*	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre up to November 29, 1913, were 3,576 bales, 3,991 bales, and 1,794 bales, respectively.

SEA ISLAND COTTON GROWING COMPETITION FOR SMALL HOLDERS IN ST. VINCENT.

The following interesting report by the Agricultural Superintendent, St. Vincent (Mr. W. N. Sands), has lately been received through the Administrator:—

The competition was inaugurated with the object of encouraging the cultivation of Sea Island cotton by small holders along the best lines and was confined this season to three districts: (a) Linley Valley, (b) Clare Valley—Questelles, and (c) Stubbs and Brighton. In each of these districts Sea Island cotton is the chief crop.

In May, meetings were held in each centre at which an average number of sixty small holders was present. The object and nature of the competition were explained and the following subjects discussed: cultivation; manuring; draining to prevent wash; thinning and spacing; and the control of pests. It was pointed out that no intercropping with ground provisions, or cassava would be allowed in the plots entered for competition, but that Indian corn might be planted in every other row in holes not less than 6 feet apart, and that pigeon peas might be planted as wind-breaks, and subsequently through the cotton when it had reached the bolling stage.

During the month of July, each of the plots entered was visited and inspected and notes made of the work already done. When necessary, opportunity was taken to advise competitors on different points requiring attention. Taken as a whole, the work in the initial stages was well done, but some competitors lost marks through planting too much corn, poor banking and lining, and by not opening good head drains.

The final judging of the plots was started on October 20 and finished on October 30. The Assistant Agricultural Superintendent assisted in the work.

The competition was arranged in two classes as follows:—

Class 1: The best Sea Island cotton cultivation of not less than 1 acre on a small holding over 5, but not exceeding 10 acres.

Class 11: The best Sea Island cotton cultivation of not less than ½ acre on a small holding not exceeding 5 acres.

There were thirty-nine entries, twenty-one in Class 1, and eighteen in Class 11.

In connexion with the judging, the following general remarks may be of interest.

LINLEY VALLEY. The work done was very creditable. On one or two plots the drainage was not satisfactory and the thinning of the plants was imperfectly performed. Where the plants had been thoroughly thinned they were bearing and holding up better than where two or more plants had been left in a hole. T. W. Clarke's steep hillside plot obtained the highest number of marks in the competition. The banks and drains were well formed; the plants were bearing heavily and due attention had been paid to the control of 'black scale' and 'leaf-blister mite'. J. Alexander's cotton was also situated on a steep hillside with land that was considered by the previous renter to be too poor for profitable cultivation in cotton or ground provisions. Alexander had put up two donkey pens and with the aid of the manure collected, combined with good cultivation, had made the land fertile again. His cotton crop was full of promise but was not quite as good as Clarke's. Both Clarke and Alexander deserve much credit for the intelligent manner in which they handled their cultivations.

The plots served as excellent object-lessons to other small holders in the district.

CLARE VALLEY—QUESTELLES. The cultivation here, with the exception of John Bramble's, left something to be desired. In the initial stages, the work was very well done. More attention, however, should have been previously given to the growth of pigeon peas and the preparation of manure to keep up the fertility of the lands. Certain of the plots although given good cultivation showed in the general condition of the crop that the soil was lacking in organic matter. Adolphus Williams tried cotton seed-meal as a manure, and it is unfortunate that owing to the absence of close supervision the seed was sown much too thickly and the plants very badly thinned. Although the growth made was strong and healthy and the bolls set well, a good proportion of those on the lower branches were lost in the wet weather. Some of the holes were only about a foot apart with two plants over 6 feet high. The beneficial effect of the manure was, however, clearly seen and an excellent crop would have been obtained but for the defect noted above in the cultivation.

Four of the competitors lost marks by allowing certain trees and plants, for instance, Hibiscus, hog plum, and sour sop, which were infested with 'black scale, to spread the pest in their plots. Where blighted trees and plants had been carefully cut out or trimmed previous to the planting of the crop very little 'black scale' was to be found.

John Bramble's plot was the best in the district and was closely followed by that of George Thomas, but the latter had not thinned out his plants so thoroughly.

The competition has aroused a considerable amount of interest and the lessons of the past season cannot fail to have a good effect.

STUBBS AND BRIGHTON. Here there were few entries because the majority of the holdings are so small that the people could not put in the acreage necessary to compete for the prizes offered. The heavy rain of the past three months had caused more loss of cotton here than in the other districts visited. The best plot was Horatio Huggin's. It was on a steep hillside with a large number of stones, but notwithstanding these drawbacks it had been intelligently handled.

S. Toussaint's plot was a good one, but the thinning out of the plants was not thoroughly done and leaves with 'blister mite' had not been picked off and burnt. Charles Huggins also showed a satisfactory plot, but he had not thinned out his plants so carefully as Horatio Huggins. The general impression formed was that the lands of this district want help in the way of manure and that more pigeon peas ought to be grown for green dressing purposes. On poor lands the plants develop leaf and boll diseases at an earlier stage and in greater intensity than on lands well looked after.

Here again it was noticed that plants singled out were more erect and bearing better than where two or more had been left together. In nearly all cases where two plants were allowed to remain the main stems had grown away from each other and were leaning at angles up to 45°. In cultivations where the growth is up to the average this causes excessive shading of the ground; lack of laterals, and in wet weather considerable loss of bolls on the under portions of each plant. Again the sun's rays cannot reach the soil under these conditions and consequently it remains 'cold' longer than it should: besides, there is very little heat radiated from the land to help ripen the lower bolls. A good many of the small holders are now convinced that it is good business to thin out to one plant in a hole, and to regulate the distances between the holes according to the fertility of the land. One grower who had tried the method for the first time and was asked what he thought of it, replied that if he lived for another 100 years he would always single out his plants.

At a meeting at Trumaka, the desire was expressed that another competition be held next season. Although meetings have not been held since the judging of the plots at the other places, still, there is no doubt that further competitions would lead to increased interest, better cultivation and better crops.

This being the first competition of its kind held in St. Vincent, a good deal of pioneer work has had to be done, still a satisfactory measure of success has been attained.

The advice and assistance of the Agricultural Officers was at all times welcomed, and the addresses of the Agricultural Superintendent were listened to with very keen interest and attention.

The total exports of Sea Island cotton from the West Indian islands during the year October 1, 1912 to September 30, 1913, was 2,154,475 ℔. valued at £139,351. In addition 459,460 ℔. of Marie Galante was shipped.

FRUIT AND FRUIT TREES.

A LITTLE-KNOWN FIG-TREE.

Familiar in Egypt under the ancient name of 'Sycomore', the interesting species of Ficus known as *F. sycomorus* has for ages been renowned for its hard-wood and for its pleasant and nutritious fruit. These fruit, which the Arabs call 'figs of Pharoah', do not possess so fine a flavour as the figs of the species Carica, but they are nevertheless very agreeable to the taste, sweet, leaving an after-taste resembling that of coco-nut. The pulp is firm and juicy.

In Egypt, the 'Sycomore' is not cultivated in orchards, but it is sometimes found growing in avenues. It forms a useful shade tree near to houses and particularly for wells to provide shade for the animals that work the native chain pump.

The geographical range of this species comprises Egypt, Abyssinia and Arabia. The tree is susceptible to cold weather. Mon. Charles Henry, ex gardener-in-chief to the Khedive, writing in *L'Agronomie Coloniale* (October 31, 1913) believes that the tree would thrive throughout the Tropics, particularly in sheltered localities. Specimens already exist in the French colonies in West Africa.

The propagation of *F. sycomorus* presents no difficulties and is done by means of cuttings 40 to 50 cm. long. In three years the branches are well formed and the young trees are ready to be planted out.

The flower of this species is different to the other representatives of the genus, for a description of which the reader may refer to Mon. Henry's article.

During each year after the tree has come in bearing, the bark of the larger branches is chipped off to quicken fructification. This treatment is analogous to 'ringing'.

The ripening of the fruit is stimulated by caprification —that is, by boring a small hole into the fruit. Latex is exhuded and the wound heals. Ripening follows three or four days after caprification.

The average harvest yield is 660 ℔. of fruit per tree.

It should be pointed out that all 'Sycomores' are not of equal value. Varieties exist but have not so far been determined; though by communicating with the writer mentioned above it would be no doubt possible for those interested in this useful tree to obtain further detailed information.

Britain's Imports of West Indian Fruits in 1912.—The figures issued for 1912, show how very small a portion of Britain's imports of tropical fruits is supplied by the British West Indies. Of a total of £2,348,375 of oranges purchased, the British West Indies only supplied £58,517, the rest coming almost entirely from Spain. In bananas, a peculiarly West Indian product, one may almost say, the showing is far worse even. Whereas nearly £2,000,000 were imported in the year, the West Indies supplied only £10,586, or about one-half per cent. Britain bought lemons, limes and citrons to the extent of over £400,000, of which the West Indies share was £1,160.

Britain's imports of West Indian bananas shows a serious falling off in the last three or four years. In fact, they have decreased from £221,000 since 1908. The Canary Islands, Costa Rica and Columbia have now the bulk of the trade. (*Canada-West India Magazine*, November 1913.)

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

VOL. XII. SATURDAY, DECEMBER 20, 1913. No. 304.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the subject of co-operative credit. The principal consideration is the manner in, and the extent to, which the Government may be expected to assist in the establishment of credit societies of the Raiffeisen pattern.

An interesting and comprehensive article dealing with 'wood-oil' trees will be found on page 403.

On page 404 an article is reproduced dealing with the subject of the effect of the new American tariff on the world's sugar industries.

The recently issued report on the Agricultural Department, St. Lucia, is reviewed on page 405.

On page 406, will be found an article which describes the recent Sea Island cotton-growing competition held in St. Vincent.

Supplementary to the editorial will be found a note on the West Indies and agricultural credit on page 408, and another dealing with credit in England on page 413.

Insect Notes and Fungus Notes, which will be found on pages 410 and 414, respectively, contain a considerable amount of information concerning legislation in relation to plant pests and diseases.

The West Indies and Agricultural Credit.

It will be noticed that the present number of the *Agricultural News* contains several references to this subject. Apart from the editorial, a note appears on the establishment of a Government Loan Bank in German South-West Africa which will lend money to agricultural credit societies; another on the interest shown by Trinidad in the new St. Vincent Credit Ordinance; and still another bearing upon the possibilities of a land settlement scheme in Trinidad. To complete the references, the reader's attention may be called to a recent article in the Demerara *Argosy* (November 22, 1913) on the subject of agricultural banks, which prophesies an early and definite declaration of policy on the part of the Government of British Guiana in regard to the establishment of co-operative banks. And finally, an important announcement in the St. Croix *Avis* (October 18, 1913) may be commented on. This announcement makes known that the Danish Government was authorized to dispose, during the period August 1 to October 31, 1913, an amount not exceeding 30,000 francs for the purpose of granting advances to owners of land in St. Croix (D.W.I.) in order to enable them to continue the cultivation of the sugar-cane.

No advances were given to any party having less than 10 acres of cane and the maximum amount advanced was fixed in each individual case proportionately to the area under cane. The amount loaned could not exceed 25 francs per acre. Interest was charged at the rate of 4 per cent. per annum and the loans are to be repaid at the time of the sale of the cane or sugar in 1914.

The Government is further authorized to dispose, for the same purpose, from November 1 to March 31, 1914, of an amount not exceeding 50,000 francs. But in this case the security required is growing cane sufficiently developed to enable an estimation of the yield to be made. Each loan cannot exceed half the estimated value of the crop, and in no case may exceed 125 francs per acre. No advances can be given to any party having less than 5 acres in plants.

Problems Awaiting Solution in Tropical Agriculture.

Perusal of the latest issue of *Tropical Life* (November 1913) which has just been received, brings to mind again the question of the fermentation of cacao and allied problems awaiting solution. Readers may remember that a recent book on the plantation manufacture of cacao was reviewed editorially in this journal a short time ago. The principal object in doing this was to present our readers with a detailed discussion (as far as space would allow) of the different points dealt with, and to emphasize that one of the crying needs of the cacao industry is that these controversies should be thrashed out. It is pleasant to observe that *Tropical Life* appreciates our endeavours. Agreement may be expressed with the views of that publication on the function of the book: 'What we ask', it says, 'is that no one will pretend to think of the book as the last word on the subject, as, on the contrary, we have only published it as the *first* word on the questions discussed. We have not gone to the expense of collecting these essays, translating them and binding them together in one book because they show what *is*, but rather that they will lead the way for planters to learn what *may be*.'

One great truth which reflection over the contents of the book brings out is that the problems involved are at the same time both steep and wide. A host of scientific points requires close, technical investigation. But that is not enough. The results from all over the Tropics which could be obtained in consequence of this work, would require to be co-ordinated. And that is where agricultural colleges would come in—incidentally themselves or rather their institution, constituting one of the great current problems in tropical agriculture.

The present position of the rubber industry is open to very much the same comments as that of the cacao industry. There is the deep and the wide side to the problems involved: the specialist, the organizer and educationalist and the press must work together.

As time goes on, tropical agriculture is likely to become more and more complicated, and will have to take far more upon itself than it has had to do in the past. It is only necessary to think of the future of the sugar industry—the practical outcome must be the manufacture of white sugar on the plantation or else the preparation of syrup. Semi-refined products will slowly die out. Tropical agriculture in the future will involve huge interests and responsibilities, and the sooner centralized research and education is instituted the safer and quicker will be the path of progress.

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Destruction of Ticks: A New Idea.

The enormous loss to stock owners in tropical and sub-tropical countries which is occasioned by tick parasitism, and the great expense necessarily incurred in connexion with dipping and spraying, scarcely need pointing out. Suffice it to say that this drain upon the capital and profits of the breeder would be largely reduced if the claims of Mr. Munro Hull of Queensland prove to be scientifically sound.

According to the *Agricultural Journal of the Union of South Africa* (October 1913), a question was asked recently in the South African House of Assembly regarding the reported discovery in Queensland, of a tick-destroying organism. The Minister of Agriculture replied that all available information had been cabled for from the Queensland Government and that the discoverer Mr. Hull had also been communicated with. Mr Hull's claim was that he had discovered a disease, which, although harmless to cattle, is fatal to the cattle tick, and he had arranged with Professors Wallace and Nutall of Edinburgh and Cambridge Universities, for an investigation as to whether a vaccine containing the organism could not be elaborated. On the other hand, it appears that the Queensland Department of Agriculture have been engaged in testing the efficacy of the alleged discovery which yielded results of a negative nature.

The Gold Coast, 1912.

Although the name of this Colony is justified by the £1,439,268 worth of gold exported during 1912, it must be remembered that the value of the exports of cacao was even greater; according to Colonial Reports—Annual, No. 770, they were worth £1,642,733. As already pointed out in this journal, the Gold Coast has now to be considered the leading British source of supply. At present the cultivations are in the hands of the native population and improvements are required in connexion with selection, fermentation, and transport. To show the difficulties of transport, it may be mentioned that in some districts where the population is sparse and labour hard to obtain, the farmer has resorted to the expedient of selling his crop as it stands to itinerant middlemen, to be picked, cured and transported to the nearest port—a system which results in much injury to the trees and in an indifferently prepared product. To such problems as these the Agricultural Department is giving very careful attention.

The most notable increases in the value of the Colony's exports during 1912, were: gold (including auriferous by-products) £399,044; timber, £89,924; kola nuts, £41,132; palm kernels, £29,474; cacao, £29,265. The principal decreases were: rubber, £50,718; specie, £17,639; palm oil £10,031.

The decrease in rubber is due to the low prices, and to the diversion of labour to more profitable occupations. The latter cause has also been partly responsible for the reduction in the exports of palm oil.

◆

Cacao Estate Valuation.

An interesting side of the subject of cacao planting, and one on which we seldom come across detailed information, is the question of cacao estate valuation. Mr. W. M. Malins-Smith, writing in the *West India Committee Circular* (December 2, 1913) on practical cacao planting in Grenada, says that the value of an estate may be arrived at either by the crop or by the estimated acreage. In the former case, the value is ten times the annual net profits plus the value of the uncultivated land and of the buildings. In the latter case, it is worked out on the value per acre of cultivated and uncultivated land plus the value of the buildings. In both methods, a maximum of 10 per cent. is deducted for disadvantages relative to situation, transport facilities, etc.

It may be interesting to note that the value of full bearing cacao in Grenada varies from £30 per acre for cacao in very poor condition up to £120 per acre for that in high class condition. 'Although much higher prices have been paid in Grenada, yet £120 for one acre of bearing cacao is the limit of a business proposition; more than that constitutes fancy or sentimental propositions.'

The net profit on an acre of bearing cacao is taken as £8. Assuming that an acre of bearing cacao is worth £80, the annual return is at the rate of about 10 per cent. It must be remebered, however, that this acre worth £80 has risen to this amount in a few years from £15, which may be regarded as the average value of an acre of young cacao.

INSECT NOTES.

FRUIT FLIES.

During recent years fruit flies have come to be recognized as serious pests, either actual or potential, in every country where fruit growing is an industry of any great importance.

The serious injuries to the fruit and the considerable losses in crop value which have resulted from the attacks of these pests have led to the enactment of quarantine ordinances in many countries directed against the importation of important species of fruit flies which are new to those localities.

The fruit flies belong to the natural order Diptera or two-winged flies, and to the family Trypetidae. The Trypetidae are flies which, as far as is known, generally deposit their eggs in or on the tissues of plants: the fruit flies select ripening or ripe fruits for this purpose; the maggots, which hatch from the eggs, live in these situations till full grown, and then pupate in the same place or in the ground.

The most widely distributed and most destructive of all these insects is the Mediterranean fruit fly (*Ceratitis capitata*). It is against this insect that the provisions of recent laws in Hawaii and Porto Rico are chiefly directed. It was this insect also which was a serious pest in Bermuda a few years ago. It is also a pest of importance in South Africa, Australia and the Mediterranean countries. *Trypeta ludens*, which is known as the Mexican orange worm, is also a pest of importance in Mexico, and a rigid quarantine is enforced to prevent its introduction into the citrus cultivations in California.

In the Lesser Antilles, neither Ceratitis nor Trypeta appear to be known. The common fruit flies, of which there are several species, belong to the genus Anastrepha, and they attack guavas, sapodillas and other fruit.

In the *Journal of Economic Entomology* for October last, there is an article by H. H. P. Severin, Ph.D., entitled The Life History of the Mediterranean Fruit Fly (*Ceratitis capitata*, Wied.) with a list of fruits attacked in the Hawaiian Islands.

In this list are the names of thirty-eight plants, among which are to be found fourteen besides the citrus group and the guavas that occur in the West Indian islands. The following names are taken from the list mentioned:—

Sour sop (*Anona muricata*), sugar palm (*Arenga saccharifera*), papaw (*Carica papaya*), star apple (*Chrysophyllum cainito*), citrus fruits such as oranges, grape fruits, mandarine orange, lime, etc., Liberian coffee (*Coffea liberica*), rose apple (*Eugenia jambos*), fig (*Ficus carica*), mango (*Mangifera indica*), banana (*Musa Cavendishii*), prickly pear (*Opuntia tuna*), Avocado pear (*Persea gratissima*), yellow oleander, lucky bean tree or milk bush (*Theretia nerifolia*), and several varieties of guavas and almond (*Terminalia Catappa*).

It will be seen from this list that there are food plants in these islands in sufficient variety to enable an introduced pest of this kind to establish itself. In any island, therefore, where it is hoped to develop a fruit industry, every precaution should be taken to prevent the introduction of any fruit flies, and further efforts should be made to learn as much as possible regarding the native species of these insects, especially with regard to the following points: the different kinds of fruit flies, the fruits attacked, and the extent of the injury done.

LEGISLATION IN REGARD TO PLANT IMPORTATION.

In Mauritius, a proclamation has recently been issued by His Excellency the Governor specifying the conditions under which plants, certain manures and timbers may be imported into that Colony, and absolutely prohibiting the importation of earth and leaf garden mould, forage and timber with the bark on.

This Proclamation is No. 81 of 1913, dated August 6, issued under the provisions of Ordinance No. 4 of 1910, and it repeals Proclamation No. 24 of May 3, 1912.

As already stated, Proclamation No. 81 of 1913 absolutely prohibits the importation into Mauritius of earth and leaf and garden mould, dung or animal droppings (except guano), forage and timber with the bark on. Grape vine cuttings and plants are also prohibited except when covered by a certificate from the Board of Agriculture (or other competent authority) of the country of origin, that the vines have not been exposed to the infection of Phylloxera for the six weeks prior to the date of shipment.

In connexion with the importation of sugar-canes or cuttings thereof, and live plants of all sorts including roots, tubers, cuttings and grafts, these are all absolutely prohibited when packed or shipped in any description of soil.

Sugar-canes or cuttings thereof, living plants or bulbils of Agave or Fourcroea and tea plants, may not be introduced unless written permission has previously been obtained from the Director of the Department of Agriculture, upon whose discretion lies the issuing of such permits. The Director of Agriculture may attach conditions to the permits and may limit the number of plants, cuttings, etc., to be introduced.

The Proclamation provides for the inspection at the port of entry of (a) sugar canes or cuttings thereof, (b) live plants of all sorts, including roots, tubers, cuttings, grafts and buds, and (c) fresh fruits from all countries except the Dependencies of Mauritius. If, on inspection, these articles, are found not to be free from insect pests, they may be ordered to be destroyed or to be subjected to such disinfection or treatment as the inspecting officer may prescribe.

Papers on legislation affecting the importation of plants and the disinfection of imported plants appeared in the *West Indian Bulletin*, Vol. X., pp. 197 and 349, respectively showing what had been done in the matter up to that time (1910), in the West Indies. The Government of Mauritius would appear to be well advised to give attention to this matter in connexion with the re-organization of its Department of Agriculture and the Proclamation now under notice seems to deal thoroughly with the necessities of the case.

From a table of statistics given in the *Queensland Agricultural Journal* (September 9, 1913) it is seen that the number of horses bred in Russia and the United States of America is far larger than in other countries. In 1912, the United States contained 20,509,000 horses, Argentina (1908) 7½ million, Germany (1907) about 4½ million, Canada (1911), about 2,200,000, Great Britain and Ireland (1911) had about the same number as Canada. British India (1910) possessed just over 1½ million horses. The fewest horses are found in South Australia which contains only just over 200,000.

LIVE STOCK NOTES.

CRUELTY TO OSTRICHES.

The subject of plumage birds has been very much in evidence of late, so that the article in the *Agricultural Journal of the Union of South Africa* (October 1913) on the absence of cruelty in clipping and quilling is likely to receive considerable attention. It is shown in this article that in the earliest stage in the development of a feather, the feather germ is at first merely an up growth of the skin consisting of the epidermis (or skin) surrounding a similar projection of dermis (or under skin). In the second stage of development the germ sinks down into the surface of the skin, the cavity which it occupies being the feather socket or follicle. The portion of the dermis within the epidermis serves to nourish the growing feather. This tissue is called the pith, medulla or pulp and gradually changes into horn.

The whole question of the possibility of cruelty bears upon these two pith tissues, the dead horny tissue above and the pith, intersected with blood vessels and some nerves, below. It will be understood that these two tissues comprise the quill; and as the feather ripens, the pith turns into horn continuously. If the feather is cut through or near the base of the horny quill, no bleeding and no pain occur; but if a feather is cut through the pith (which in an immature one, extends at least three-quarters of the way up the quill) there will be profuse haemorrhage and possibly some pain will be felt.

But even if an immature feather is accidentally plucked or gets broken off or trampled out, it severs its connexion from above the germ, generally at the point where the pith is changing into horn. But the germ is left behind, and another feather will appear in the place of the one prematurely removed.

The only operation in ostrich management which can in any way be supposed to suggest cruelty to the bird, is that of drawing the quills. After a feather has been cut, the lower part of the quill is left in the socket to mature, that is, become horny throughout its entire length. It is then a dead structure and entirely devoid of all nerves and blood vessels. It is then pulled out. Were it not so deeply fixed within the socket it would fall out of its own accord. Indeed in time it always does, but this natural moulting is irregular and interferes with a regular crop of plumes. So the farmer strives to avoid this irregularity by doing what nature would have done.

Testing Ostrich Eggs.—Another article in the same journal gives directions for testing ostrich eggs. The operator should envelop his head and shoulders in a dark cloth, leaving only a small opening before his face, in which the egg is held. He then holds the egg up towards the sun so that he would present the appearance of looking through the egg at the sun.

A fresh egg presents a yellowish orange appearance, and the yolk may be distinctly seen as a darkish mass floating in the white. In a freshly laid egg, the air-space is only very small. An unfertile egg presents exactly a similar appearance and cannot be detected until incubation has commenced.

After the seventh day that the eggs have been in the incubator, the germ or embryo of a fertile egg will have grown a little and the air-space will have become much larger. On the seventh day, then, it is generally easy to tell which eggs are fertile and which unfertile.

MAL DE CADERAS.

Reference has already been made in the *Agricultural News* (see Vol. XII, p. 345) to the South American equine disease called Mal de Caderas. In continuation of the subject, the following information received from British Guiana by the Government of Grenada and forwarded to this Office, will prove interesting. It may be added that the Grenada Agricultural and Commercial Society is endeavouring to get steps taken to prevent the introduction of this fatal disease into that Colony.

The Veterinary Committee of the Board of Agriculture assisted in its deliberations by Dr. E. P. Minett, Assistant Government Bacteriologist, Mr. A. C. Farant, F.R.C.V.S., and Mr. G. E. Bodkin, Government Economic Biologist, has decided that a disease at present and for some time back prevalent among mules and horses in certain districts of the county of Berbice which had been provisionally described in his reports by the Government Veterinary Surgeon as cerebro—spinal meningitis, is not that disease, and that judging from its characteristic symptoms and from a report by Dr. Minett on an epidemiological survey and investigation made by him into the probable causes of the disease it is the South American equine disease Mal de Caderas.

SYMPTOMS.

The principal symptoms noticed here are:—

(1) Loss of condition and progressive anaemia with rapidly increasing weakness, at first with failing appetite but in later stages the appetite is good.

(2) The temperature of the affected animal is febrile in the early stages of the disease, rising in acute cases to 105°F., but falling in later stages to normal (100·2°-101°F.) and tending in chronic stages to become sub-normal (98°-99°F.).

(3) The earliest characteristic symptom is the setting in of paralysis in the hindquarters accompanied by dragging and characteristic crossing of the hind-legs. The animal staggers and its hindquarters osciliate from side to side. In the stable it supports itself against a wall, but not infrequently in the open it falls down.

(4) Albuminuria and haematuria are noticed in some cases, but not in all.

(5) Eruption may occur on the neck, shoulders and hindquarters. Conjunctivitis and chemosis are often present;

(6) The disease is a very fatal one; animals may live from three weeks to as long as five or six months after the setting in of the paralysis but comparatively few, if any, completely recover.

(7) Animals that apparently recover from the disease are for a prolonged period so weak in the hindquarters as to be useless for draft purposes.

(8) Animals that have died from the disease show practically no abnormal past mortem conditions other than congestion.

The accuracy of Mr. Minett's diagnosis of the disease has since been proved by him having found trypanasomes in very large numbers in the blood taken from affected animals during the earliest acute fertile stage, thus confirming observations made by Mr. Veterinary Surgeon A.C. Farrant, F.R.C.V.S. These causative organisms are absent from, or have not been found in the blood of affected animals in later stages of the disease.

Mal de Caderas is confined to horses, mules and asses; it has not been known to attack cattle.

GLEANINGS.

In Dominica the cacao crop is ripening and the second lime crop is falling.

The Grenada cacao crop is late owing to the prolongation of the annual drought.

On the whole, the work of the new lime factory in St. Lucia is progressing very satisfactorily. Further information will be published in due course.

Bulletin No. 2[illegible] [illegible] the Ohio Agricultural Experiment Station deals with the subject of county experiment farms. For their institution and management a special Act has been passed.

According to the *Louisiana Planter* (November 8, 1913), the State of Texas is importing Indian corn from Argentina. Last year a quarter of a million bushels was received.

The early cotton crop in Nevis is now almost reaped. The late crop is ripening. The returns in some localities will not be as good as was first anticipated on account of mildew and boll dropping.

The Ordinance recently passed in St. Vincent for the encouragement of agricultural banks has been published in the *Bulletin of the Department of Agriculture of Trinidad and Tobago* (November 1913).

In St. Vincent the month of November has been a depressing one for planters owing to the receipt of continuous rains. The reaping of the arrowroot crop was retarded and there was further extensive damage to the cotton crop.

In continuation of the article on the Grevy zebra in the last issue of the *Agricultural News*, it may be noted that an interesting account appears in the *Bulletin de la Societé Belge d'Etude Coloniale* (November 1913) on the subject of the zebra as a draft animal.

In St. Kitts the cane crop would benefit by the receipt of heavier rains, though recently the weather has not been unfavourable. It is interesting to note that the canes, especially the ratoons, are arrowing profusely—an occurrence which, in St. Kitts, is somewhat unusual.

A novel implement in the form of a combined fork and shovel is described and illustrated in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* (September 1913). It is said to be extremely efficient for the handling of litter, sawdust, leaves, weeds, and similar loose material.

In order to encourage local industry, and to create a larger number of peasantry, it is practically decided that the 2,000 acres of Crown Land in the ward of Chaguanas, Trinidad, shall be split up into small holdings. The land is suitable for rice cultivation. (*Port-of-Spain Gazette*, November 20, 1913.)

It is stated in *Nature* (November 6, 1913) that the Natal Sugar Growers' Association has decided to establish a sugar school, the aim of which will be to prepare young men for the technical control and investigation of the manufacture of cane sugar. Two lecturers—one in the chemistry and one in the bacteriology of cane sugar—are soon to be appointed.

Those who are interested in intensive agriculture should obtain *Diplomatic and Consular Reports*, No. 5221, Annual Series, which describes the trade and commerce of Denmark for the year 1912. It gives an account of the co-operative movement, and of the shipments of agricultural produce which principally—one may almost say entirely—comprise this country's exports.

A rather interesting case of adulteration is described in a notice of the United States Department of Agriculture. It appears that a certain fungicide designated 'French Bordeaux Mixture' offered for sale, was labelled 'The Preparation is the normal formula with some 33 per cent. copper hydrate in the dried precipitate.' Analysis showed that the mixture contained only 18·84 per cent. of copper hydrate.

Colonial Reports—Miscellaneous, No. 85, deals with the results of the mineral survey of Southern Nigeria, 1911. One of the most important minerals from the economic aspect is the coal, which is of the sub-bituminous type, and compares favourably with many of the sub-bituminous coals which are mined in Canada and the United States for use as fuel on railways, and for all classes of industrial work.

An abstract in the *Journal of the Board of Agriculture* (November 1913) describes the results of feeding experiments with Para rubber seed cake conducted in England. These experiments have shown Para cake to be one of the most digestible concentrated food-stuffs available. This is no doubt partly due to the small amount of crude fibre present, namely 3·15 per cent. These favourable results should prove gratifying to rubber growers in the Tropics.

According to *The Board of Trade Journal* (November 6, 1913) an agricultural bank has been established in German South West Africa by Imperial Ordinance. The initial capital of about £491,700 will be provided by the Government of the colony, but further capital, if necessary, may be raised by debentures. The bank is authorized to make advances to farmers on mortgage of land for the purpose of affecting permanent improvements. It may also make advances, without demanding a mortgage bond as security, to public bodies and to co-operative societies for agricultural purposes.

STUDENTS' CORNER.

INFORMATION CONCERNING LAND MEASUREMENT.

III.

In the last article on this subject, the way to lay out survey lines was described, an account having been given in the first article of the methods employed in the measurement of these lines. It is proposed now to deal, necessarily briefly, with a few of the practical difficulties sometimes encountered by the field surveyor, and to conclude with a few simple instructions connected with the plotting of field measurements on paper. It may be well, before proceeding, to remind the student again that the object of giving this information is not primarily a didactic one; it is the aim, not so much to instruct as to suggest, thereby opening the eyes of the student to a branch of agricultural science which may previously have been unfamiliar to him.

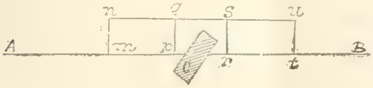

FIG. 33.

Sometimes, in measuring a field, the line of sight is impeded by an object such as a building. Let A B be a chain line (see Fig. 33), the measurement of which is prevented by the building C, how would you proceed? The diagram shows how to get over the difficulty. It will be observed that the setting out of line *mn*, for instance, involves a certain procedure which we have not yet dealt with; what is it?

Having given the correct answer to this question, the student will then appreciate the assistance afforded by Fig. 34 of which A B is a chain line. The numbers 40, 50 and 30 represent so many links of a chain, respectively. What do these figures signify? Those students who have studied the first book of Euclid, will know that since $40^2 + 30^2 = 50^2$, $mB^2 + Bn^2 = mn^2$; therefore, by Euc., 1, 47, B*n* is perpendicular to B*m*, or *m*B*n* is a right angle.

Another example of the application of geometry to overcome the difficulties of a field survey is the case where it is required to measure a line impeded by an object not obstructing the sight. In Fig. 35, let AB be a chain line, the direct measurement of which is prevented by the unforeseen obstruction of a pond, P. Measure A*n* till it reaches to, or near to the edge of the pond, and fasten the end of the chain to the ground with arrows at *m* and *n*, the distance *mn* being made half a chain or 50 links. Take hold of the middle cf the chain, and extend it firmly, till its two halves rest in the position *mo*, *on* thus making an equilateral triangle *mno*, each side of which is 50 links. Then in the direction *mo* measure to nearly opposite the middle of the pond, as to *q*. Reference to the figure will show that at *q* a similar procedure is repeated, and *qr* prolonged to cut *ab* at *s*. Ms will then be equal to *mq* or *qs*, which being added to A*m* will give the distance A*s*. The student should endeavour to explain the reason why the three sides of the triangle *mqs* must be equal.

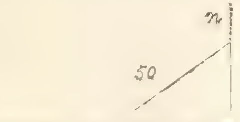

FIG. 34.

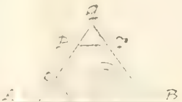

FIG. 35.

It will be necessary further to take off sets to the margin of the pond during the measurement of the lines *mq*, *qs*.

PLOTTING A PLAN

Reverting to Fig. 32 in the article in the last issue of the *Agricultural News*, it may be suggestive to inform the student that in plotting the measurements recorded in connexion with the survey discussed there, it is best to lay down first the line A B: the triangle *mn*D should then be laid down, and its sides D*m*, D*n*, prolonged to the station C and E, from whence the lines CB, EA, must respectively reach the points B and C, and the line CE equal to the measured distance to confirm the accuracy of the work. This done, the off-sets on the several lines may be laid off, through which the fences are to be drawn.

For details as to the scale to work with, and the instruments required, the student should refer to any of the following text-books.—

Practical Surveying: A Text Book for Students preparing for Survey Work in the Colonies. By G. W. Usill. London, Crosby Lockwood & Sons, 1904.

Practical Surveying: By Henry Adams. Macmillan & Co , Ltd., St. Martins Str. ,London, E.C. 1913.

Land Surveying: by T. Baker and F. E. Dixon. London, Crosby Lockwood & Sons, 1905.

From the last mentioned work the greater portion of the information presented in the foregoing articles has been abstracted.

Difficulties of Applying the Raiffeisen System in England.—The following reasons have been advanced in the Report of the Agricultural Organization Society of England, 1913, as affording a partial explanation of the comparatively small progress made in England and Wales, in regard to the establishment of unlimited co-operative credit societies:—

(1) The fact that the rural districts of England and Wales are not burdened by the usurer to the same extent as in many foreign countries and in Ireland. (2) The extent to which England and Wales are served by Joint Stock Banks as compared with continental States. (3) The unpopularity in England of the principle of unlimited liability. (4) The unwillingness of the average farmer and small holder to disclose his financial position to his neighbours when he wishes to borrow. (5) The general custom of merchants to give long credit to agricultural customers. (6) A general preference on the part of cultivators to obtain goods on credit rather than to borrow actually in cash. (7) Lack of enthusiasm on the part of the class of men required to undertake the responsibility of acting on committees and the scarcity of keen and properly qualified men to act as secretaries. (8) The difficulty of financing societies if formed.

The above reasons are extremely interesting and suggestive, and should be contrasted with existing causes of a similar kind in the West Indies. For information on agricultural credit in the West Indies see pp. 401 and 408 of this issue.

FUNGUS NOTES.

CEYLON LEGISLATION AGAINST PLANT PESTS AND DISEASES.

A recent bulletin (No. 6, September 1913) of the Ceylon Department of Agriculture, by Mr. F. Petch, Mycologist to the Department, gives particulars of the steps taken from time to time in that country to prevent the importation of plant pests and diseases, and to deal with those already existing in the colony which are actually or potentially destructive. Legislation to this end was begun with the issue of an Ordinance in 1901, prior to which date Ceylon was herself an outlaw in the matter of plant disease protection, every other tropical colony legislating against her because of the existence in Ceylon of the coffee leaf disease. Now it is pointed out that Ceylon has led the way among tropical countries by adopting a general Ordinance designed to deal with diseases and pests already existing in the colony Legislation of the first named character already exists to a greater or lesser extent in the West Indian colonies, and efforts have been made, particularly in connexion with the leaf-blister mite of cotton towards legislative control of existing pests. In view of the necessity that may arise however, for measures of a more general nature, the information contained in the above-mentioned bulletin is of interest.

REGULATION OF IMPORTS.

The Ordinance of 1901 above referred to, was of the usual character, prescribing fumigation of imported plants, fruit, and seeds, and empowering the issue of special regulations from time to time. Advantage has been taken of this to prohibit the importation of cacao plants from the Dutch East Indian colonies, to secure the compulsory disinfection of Indian tea seed and the fumigation of all coco-nuts imported in the husks. All living plants, bulbs, etc , oranges and other fruits of the Citrus family, and cotton seed are subject to fumigation with hydrocyanic acid unless accompanied by a certificate that they have already undergone such treatment. Tea seed is fumigated with formalin vapour. As illustrative of the amount of work entailed, it may be noted that during 1912, 1,148 cases of oranges and lemons, 4,977 cases of tea seed and 565 packages of bulbs, plants, etc., were treated at the fumigatorium. It will be seen that the responsibility of deciding whether plants shall be fumigated or not is taken out of the hands of the examining officer. In view of the impossibility of making sure of the absence of diseases or pests even by the most careful inspection, much less by examination under the conditions involved in the handling of large amounts of material at the port of entry, this is probably the best method to adopt. It is indeed the only method possible unless the unhurried services of an official or officials, expert in both mycology and entomology, are available, a combination of circumstances of unusual occurrence. Under either system difficult problems must arise from time to time. For instance, what is to be done with a large consignment of seeds representing scores or hundreds of species, put up in attractive packages ready for sale, and possibly containing the germs of a great variety of diseases some of which are impossible of detection, or of elimination without the destruction of the seed? It must be recognized that only a degree of safety, and probably not a very large one, is obtainable by any method short of the total exclusion of plants known to be susceptible to particular diseases which it is desired to avoid. Fumigation with cyanogen has come to be accepted as a satisfying ritual for the exorcism of pests and diseases, but there is reason to doubt whether in a large number of its applications the results would bear the test of critical examination. One proviso which experience in the West Indies has proved to be a necessary one, is to the effect that plants will not be exempted on the strength of a certificate of inspection from their place of origin.

INTERNAL LEGISLATION.

Legislation of this nature has been evolved in Ceylon in close consultation with the Planters' Association and Agricultural Societies so that the inevitable objections to Government interference should be minimised as much as possible. Draft Ordinances framed by a Committee appointed by the Government were published, and submitted to and discussed at length by the Ceylon Planters' Association and the Agricultural Society. They were issued in legal form in Ordinance No. 6, 1907, reprinted in full in the bulletin under review. The Ordinance provides for the issue of schedules specifying: (a) the insects, parasitic plants, or fungi which are declared to be pests for the purposes of the Ordinance, and (b) the measures which it shall be within the power of the Plant Pests Boards to require to be taken for the prevention, arrest, or eradication of such pests. The Plant Pests Boards with whom the responsibility for the execution of the Ordinance rests are appointed by the Governor in consultation with representative agricultural bodies. They consist for each district of the Government agents of the province and district respectively, and not less than four nor more than seven persons as unofficial members appointed to hold office for a term of three years. Two of these persons at least are to be recommended by the local planters' association or associations, and of the remainder, one at least selected as a representative of each of the racial communities which form any considerable proportion of the owners or occupiers of land in the district It is the duty of any member to report the existence or suspected existence of any pest. The boards have powers to issue notices requiring the carrying out of such measures as they think desirable, provided that these conform with the schedules issued by the Governor-in-Executive Council under the Ordinance. They have the power of entry for inspection and also for carrying out the required measures at the cost of the owners and occupiers, in case of their failure or neglect to comply with the notices served on them. The Governor-in-Executive Council is empowered to afford such compensation as he may think fit. The boards are independent of each other except that they are bound to give notice to those of adjoining districts of the existence within their boundaries of proclaimed pests

So far four proclamations have been made under the Ordinance. The first was in order to provide for the destruction of a large number of coco-nut palms blown down by a cyclone, whose trunks it was feared would menace the coco-nut industry by providing breeding places for the destructive coco-nut beetles. In this case owing to the destitution caused by the cyclone, government assistance had to be provided in order to dispose of the trees. The next proclamation was that of the stem bleeding disease of the coco nut tree, and required the cutting out and burning of the diseased parts of the tree, the scorching of the wound and its treatment with tar. To see to these remedies being carried into effect, twelve inspectors held office for about fifteen months.

In 1912, shot-hole borer of tea was proclaimed, and more recently canker of Hevea has been proclaimed at the request of the rubber planters in order that there may be no delay should concerted action be necessary against this disease.

THE SOIL

NON-AVAILABLE WATER IN THE SOIL.

The following article is a summary appended to Research Bulletin No. 3 of the University of Nebraska. It deals with the results of experiments conducted with the object of determining the relation of the final water content of the soil to the hygroscopic coefficient, and to determine to what extent the moisture is removed from the different portions of the subsoil not penetrated by plant roots:—

Water-tight cylinders, 6 feet long and holding about 100 lb. of soil, were either filled with dry soil, saturated with water, and drained before sealing at the bottom, or filled with soil already containing the desired amount of moisture. These were removed to a greenhouse, seeds of wheat, milo, beans, or maize planted in the moist surface soil, and no more water added, the resulting plants being allowed to grow until they matured normally or died. Upon the death of all the plants in a cylinder it was opened, both the total and the free water in each 3-inch section of soil determined, and the distribution of roots observed. In other cylinders three perennial desert legumes were grown until they died or were near their limit of endurance, then the cylinders were opened and the moisture content and root distribution determined.

In all the cylinders bearing plants, a hard crust developed below the surface mulch of dry soil but it seemed to have no injurious effect. The formation of such a crust is to be regarded as unavoidable where during a prolonged period of rainless weather, plants with a well-developed root system and a very limited amount of moisture in the subsoil are transpiring a large amount of water.

In their ability to exhaust the moisture of the subsoil before dying, Red Fife wheat, Kubanka wheat, milo, Mexican beans, and maize showed little difference; but in their ability to continue alive after first showing serious injury from drought they exhibited marked differences. The interval between wilting and death in the case of the beans amounted to only a few days, but in that of wheat and milo it often extended to many weeks. Where there was a well developed root system and no remarkably unfavourable conditions occurred before the death of the plants, the moisture content could be reduced by any of these plants almost to the hygroscopic coefficient.

In experiments with perennial desert legumes, the plants remained alive after the water content had fallen slightly, but distinctly, below the hygroscopic coefficient, even to the point at which all the above-mentioned annual crop plants had died. Under favourable conditions these legumes adjusted themselves to the gradually increasing dryness of the soil by dropping their leaves one by one, but where, with the subsoil moisture already reduced to near the hygroscopic coefficient, conditions causing an abnormally high transpiration suddenly set in, death occurred without the leaves having dropped. While the experiments furnish no evidence of any ability on the part of these legumes to utilize *for growth* the last portion of free water, they indicate that this portion has a very high value for the maintenance of life and that even some of the water below the hygroscopic coefficient may be available for the maintenance of life in these plants.

In the portions of a semi-arid subsoil where roots are well developed, the final content of free water is independent of the distance from the surface, except where the stored water is much in excess of the amount required for the complete maturity of the plant.

When the portion of the subsoil, in immediate contact with the roots, contains only a comparatively small amount of free water, crop plants may die quickly if conditions are such as to cause an unusually rapid transpiration. An abundance of free water in deeper portions of the subsoil, into which but few roots have been developed, may not avail to carry the plant over such a critical period.

The economy in the use of a certain amount of free water stored in the subsoil may be much affected by its distribution. A high content confined to the portion of the soil near the surface may induce a rapid growth of the plants and an economical use of the water in so far as the production of foliage alone is concerned, but the resulting large transpiring surface may cause the death of the plants before they reach maturity. The same amount of free water distributed through a greater depth may induce a slower growth, allow a longer lease of life, and so permit of the production of seed, while if the same amount be distributed through a still greater depth the content of free water may everywhere be too low to permit of the development of roots, thus rendering the free water non-available.

The loss of water from the subsoil of dry lands under crop seems to take place almost entirely through transpiration. In the absence of plants the loss from the subsoil is small. The stored moisture of the different depths of subsoil in the field becomes available to the plants by the roots being developed into these depths, but little moisture being elevated to the roots by capillarity. However, in the case of subsoils saturated in cylinders or pots and comparable to such field subsoils as are only a few feet above the water-table, the content of free water is so high that large amounts of moisture may be elevated to the roots by capillarity. The amount of water retained by a soil saturated in pots or cylinders is far in excess of the amount retained by a similar soil saturated in a field where the water-table is at a considerable depth below the surface, as in ordinary dry-land soils.

To obtain a basis for comparing the available moisture in soils, either the hygroscopic coefficient or the wilting coefficient may be used. In general the one may prove as satisfactory as the other, but in considering the germination of seeds and the development of roots and hence the whole of the earlier portion of the life of annual crop plants, the wilting coefficient appears the preferable; while in considering the production of seed in the case of annual crop plants, and the maintenance of life and even the growth of perennial plants, the hygroscopic coefficient appears much the preferable.

In the case of ordinary dry-land soils, the water-table being at a considerable depth below the surface, the *maximum* amount of soil water available to plants, for growth and for the maintenance of life, is *approximately* equal to the *free-water*—the difference between the total water and the hygroscopic coefficient—in these portions of the soil and the subsoil occupied by the roots. For some plants the available water appears to be somewhat greater and for others somewhat less than the free water.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, December 2, 1913; Messrs. E. A. de PASS & Co., November 21, 1913.

ARROWROOT—2¾*d.* to 4¾*d.*
BALATA—Sheet, 2/9½; block, 2/0½ per ℔.
BEESWAX—£8 10*s.* to £8 17*s.* 6*d.*
CACAO—Trinidad, 66/- to 75/- per cwt.; Grenada, 63/- to 69/-; Jamaica, 60/- to 66/6.
COFFEE—Jamaica, 54/- to 57/-.
COPRA—West Indian, £31 15*s.* to £32 per ton.
COTTON—Fully Fine, no quotations; Floridas, no quotations; West Indian Sea Island, 15½*d.* to 20*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Quiet, 34*s.* to 60*s.*
ISINGLASS—No quotations.
HONEY—24*s.* to 28*s.*
LIME JUICE—Raw, not in request; concentrated, £30 to £33; otto of limes (hand-pressed), No quotations.
LOGWOOD—No quotations.
MACE—1/8 to 2/6.
NUTMEGS—4½*d.* to 6½*d.*
PIMENTO—2 1/16*d.* to 2⅛*d.*
RUBBER—Para, fine hard, 3/1; fine soft, 2/9½; Castilloa, 1/8 per ℔.
RUM—Jamaica, 2/4 to 5/- per gallon.

New York.—Messrs GILLESPIE BROS. & Co., November 28, 1913.

CACAO—Caracas, 14¼c. to 15c.; Grenada, 13¾c. to 14c; Trinidad, 13¾c. to 14c.; Jamaica, 13c. to 13¾c.
COCO-NUTS—Trinidad and Jamaica, selects, $36·00 to $37·00; culls, $22·00 to $23·00 per M.
COFFEE—Jamaica, 10½c. to 15½c. per ℔.
GINGER—8¾c. to 11¼c. per ℔.
GOAT SKINS—Jamaica, 50c.; Antigua and Barbados, 45c. to 48c.; St. Thomas and St. Kitts, 42c. to 45c. per ℔.
GRAPE FRUIT—Jamaica, $1·25 to $3·25.
LIMES—No quotations.
MACE—50c. to 56c. per ℔.
NUTMEGS—110's, 12c. to 12¼c.
ORANGES—Jamaica, no quotations.
PIMENTO—4c. to 4¼c. per ℔.
SUGAR—Centrifugals, 96°, 3·64c. per ℔.; Muscovados, 89°, 3·14c.; Molasses, 89°, 2·89c. per ℔., all duty paid.

Trinidad.—Messrs GORDON, GRANT & Co., December 8, 1913.

CACAO—Venezuelan, $14·50; Trinidad, $14·10 to $14·35.
COCO-NUT OIL—$1·05 per Imperial gallon.
COFFEE—Venezuelan, 15c. per ℔.
COPRA—$5·35 per 100 ℔.
DHAL—$4·75 to $5·00
ONIONS—$2·75 to $3·00 per 100 ℔.
PEAS, SPLIT—$6·00 to $6·25 per bag.
POTATOES—English, $1·30 to $1·50 per 100 ℔.
RICE—Yellow, $5·40 to $5·50; White, $4·75 to $4·80 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. JAMES A. LYNCH & Co., Ltd., November 29, 1913; Messrs. T. S. GARRAWAY & Co., November 21, 1913.

ARROWROOT—$5·25 to $6·50 per 100 ℔.
CACAO—$13·00 to $14·50 per 100 ℔.
COCO-NUTS—$24·00.
HAY—$1·50 to $1·60 per 100 ℔.
MANURES—Nitrate of soda, $70·00; Cacao manure, $50·00; Sulphate of ammonia, $82·00 to $85·00 per ton.
MOLASSES—No quotations.
ONIONS—$2·75 to $3·00 per 100 ℔.
PEAS, SPLIT—$5·80 to $6·00 per bag of 210 ℔.; Canada, $4·00 to $4·50 per bag of 120 ℔.
POTATOES—Nova Scotia, $2·50 to $4·00 per 160 ℔.
RICE—Ballam, $5·30 to $5·40 per 190 ℔.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, $4·00 per 100 ℔.

British Guiana.—Messrs. WIETING & RICHTER, December 6, 1913; Messrs. SANDBACH, PARKER & Co., December 5, 1913.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	5c. per ℔.	—
BALATA—Venezuela block	No quotation	—
Demerara sheet	65c. per ℔.	—
CACAO—Native	14c. per ℔.	13c. per ℔.
CASSAVA—	60c.	—
CASSAVA STARCH—	$3·50 to $4·00	—
COCO-NUTS—	$16 to $20 per M.	$26 per M.
COFFEE—Creole	14c. per ℔.	15c. per ℔.
Jamaica and Rio	15½c. per ℔.	16½c. per ℔.
Liberian	13 c. to 16c. per ℔.	14c. per ℔.
DHAL—	$4·25 to $4·50 per bag of 168 ℔.	$4·75 per bag of 168 ℔.
Green Dhal	$5·00	—
EDDOES—	$1·32	—
MOLASSES—Yellow	None	—
ONIONS—Teneriffe	—	—
Madeira	8c.	8c.
PEAS—Split	$6·00 per bag (210 ℔.)	$7·00 per bag (210 ℔.)
Marseilles		—
PLANTAINS—	10c. to 16c.	—
POTATOES—Nova Scotia	$2·25 to $2·50	$3·00 to $3·80
Lisbon	—	—
POTATOES-Sweet, B'bados	$1·44 to $1·68 per bag	—
RICE—Ballam	No quotation	—
Creole	$4·75 to $5·00	$4·50 to $4 80
TANNIAS—	$1·56	—
YAMS—White	$3·00	—
Buck	$1·92	—
SUGAR—Dark crystals	$2·15 to $2·20	$2·15
Yellow	$2·50 to $2·60	$2·40
White	$3·75 to $4·00	$4·00
Molasses		—
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	—

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  Mozambique: Its Agricultural Development, Lyne, 199.
  Plantation White Sugar Manufacture, Harloff and Schmidt, 347.

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  Rubber and Rubber Planting, Lock, 379.
  Rural Science, Green, 167.
  The Cane Sugar Factory, Scard, 215.
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